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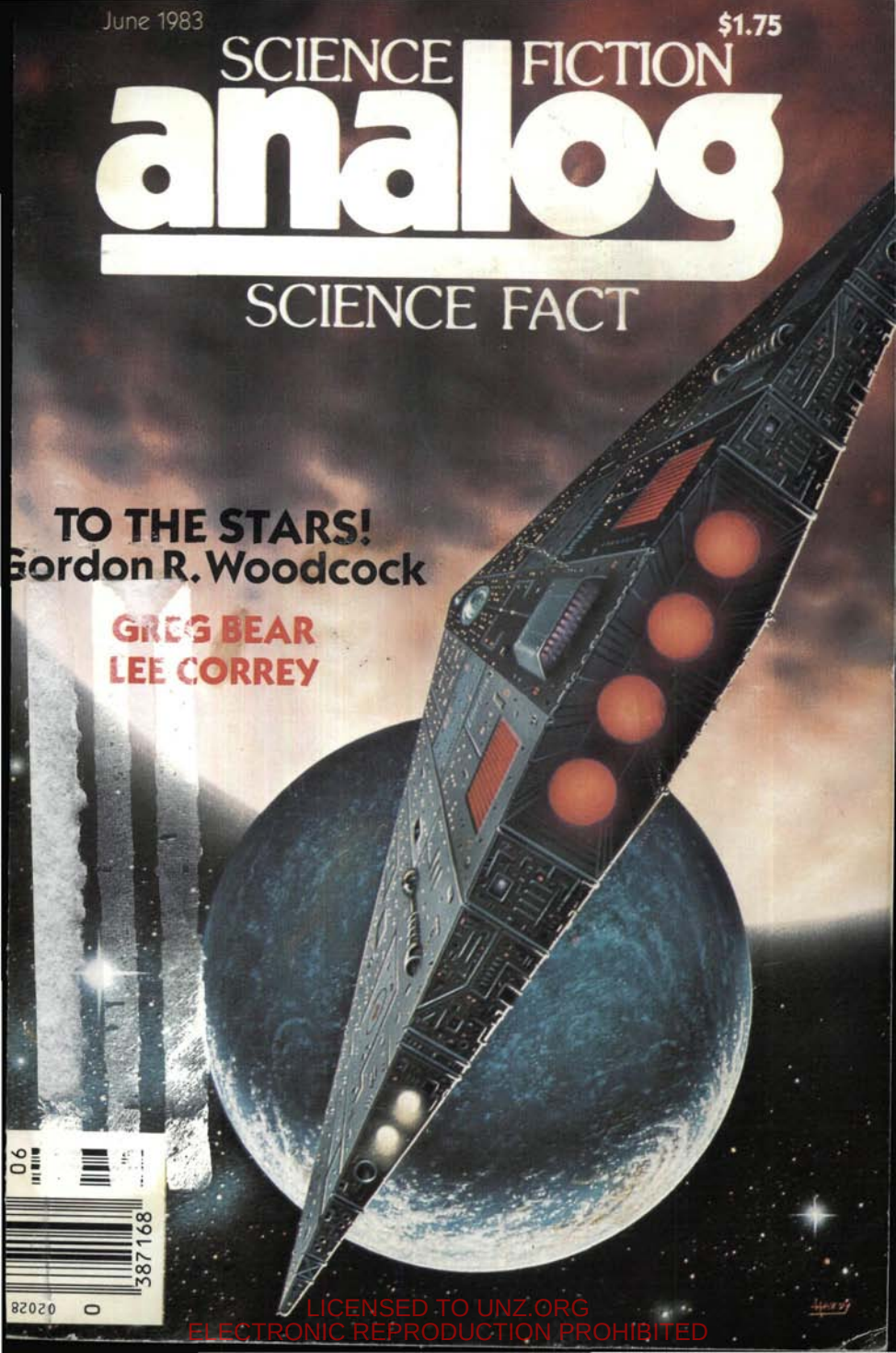

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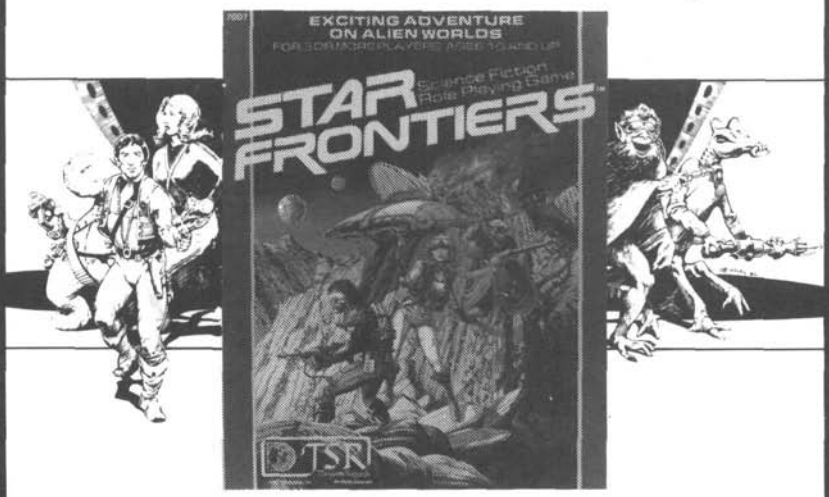

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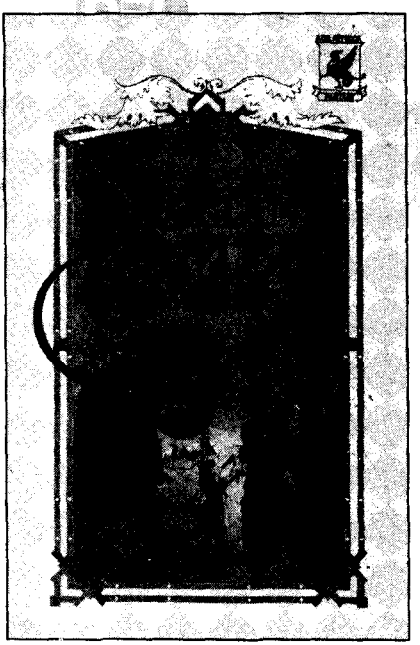

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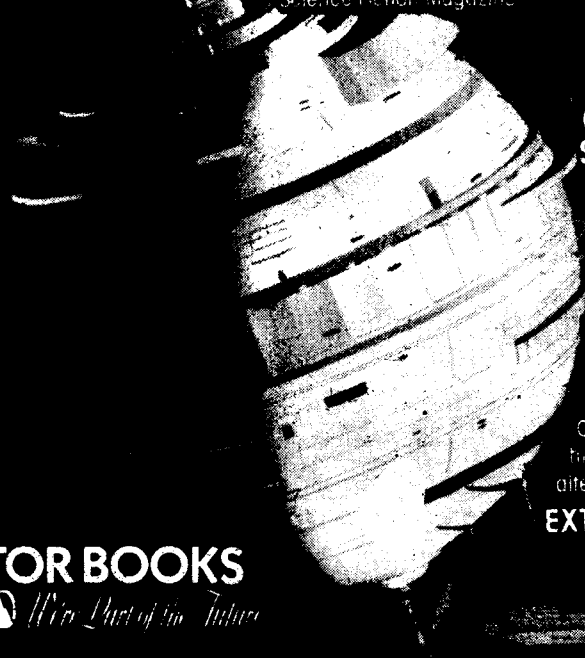

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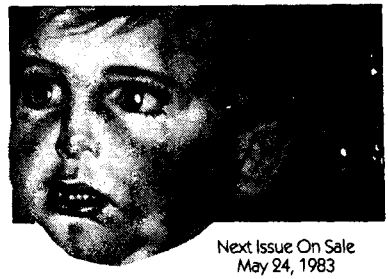

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Editorial

DRUG ABUSE

Stanley Schmidt

A few months ago headlines were full of a rash of incidents beginning with a death resulting from a recently bought Tylenol capsule contaminated with cyanide. There followed several similar occurrences, involving other poisonings of nonprescription drugs and other consumer products in stores or before they reached the shelves. The subject has quieted down a bit lately, but it hasn't gone away. We still see frequent references to ongoing attempts to solve these crimes and widespread reluctance to buy over-the-counter drugs for fear they've been doctored.

Using painkillers and cold remedies to randomly murder strangers is not what people usually think of when they hear the term "drug abuse," but I think it qualifies as a particularly nasty form of just that. Like other forms of drug abuse, it has harmful side effects. The fear of tampering spread to everything consumable that was handled by other people, and effectively killed Halloween, at least for 1982. At our house we had six trick-or-treaters; the previous year we had forty. In one bag of twenty candy bars I found three I was unwilling to hand out because of possibly suspicious damage to their wrappers.

The whole episode raises a multitude

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of interesting questions, of which I intend to focus on just two:

(1) Why do people do things like this?

(2) What can the rest of us do about it?

These questions are not as separate as they might first appear.

The answer to (1) can no doubt be expressed in very complicated ways; I doubt that anyone fully understands all the details. Actually, the question has at least two parts, societal and individual. There's been a lot of speculation on why so *many* crimes of similarly bizarre type occurred in such a short time, and questions have been raised about whether the wide publicity given them did more harm or good. That's something I don't plan to get into now, though I sympathize with the *Analog* writer who said he was glad he had decided *not* to write a story about Tylenol-type tampering a few months before it started happening. (It happened anyway, but if he'd published the story first he'd never know whether he should feel partly responsible.) Granting that publicity probably played a role in the epidemic, by giving ideas to people who wouldn't have thought of them on their own, the question ultimately boils down to why would an *individual* do something like that. Whether he thought of it himself or got the idea from someone else is a very secondary issue. We all heard about these crimes, but very few were moved to copy them. I don't claim to understand what goes on in the kind of mind that *does* originate or copy such actions, but the essence of it can be summed up in very simple practical terms for the rest of us.

Those people are *nuts*.

Which leads to question (2): skipping over such stopgap defenses as x-raying Halloween candy and switching to "tamper-proof" packaging, what do you *do* with homicidal nuts (assuming you can catch them)?

There are those who prefer to use less harsh language, and let their euphemisms guide their actions. Don't call them "nuts" or "crazy" or "insane," we are told; these people are *sick*.

Well, of course they are. That seems too obvious to bother mentioning. *Healthy* minds don't do things like this.

But does that mean sympathy is the appropriate response?

Maybe so, at some level and in some part. A rabid dog is sick, too. I can feel sorry for him, for that—but I will *not* let him run loose to bite people. The fact that he is dangerous is not at all his fault, but it is a fact that must be dealt with by all who come in contact with him. Any sane way to deal with it must start by keeping him out of circulation. If, while you're doing that, you can also come up with a way to cure him, that's very nice. But if you have a rational interest in your own survival and that of your non-afflicted fellows, your *first* priority has to be to keep the danger away from them.

And if you do decide to release the dog, you'd better be *sure* you've *really* cured him first.

A homicidal maniac poses essentially the same kind of problem as a rabid dog. Appropriate solutions are correspondingly similar.

Rabid dogs are usually destroyed, partly because rabies is such a *nasty*

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disease (have you ever read a detailed description of its symptoms?), partly because people tend to place less intrinsic value on canine than on human life, and partly because the disease is generally regarded as quite incurable. (Although there was at least one recent and much-publicized case of a human victim recovering, and one of my spies recently told me that Amerindian folk medicine did include a pretty reliable cure—a claim which seems worth some serious investigation by medical science.)

The alternative to destroying the dog is to keep it isolated but alive as long as possible. In the case of rabies, that's not very long, and the dog's last hours will be made so miserable by the disease that the kindness of prolonging them is highly questionable. In the case of a pathological human killer, the symptoms are not so acutely painful (anyway to the "patient"!) and they can last several decades. The sheer monetary expense of keeping a criminal isolated but alive for that long is a favorite argument used by proponents of capital punishment. They point out, quite correctly, that building, maintaining, and guarding high-security prisons, and feeding unproductive and dangerous inmates, are far from cheap; furthermore, the existing facilities are hardly equal to the demand. They go on to raise the question, "Why support useless people?" Some argue that the object of confinement should be to rehabilitate rather than punish, but the empirical record of rehabilitation is pretty dismal. If what we're dealing with is indeed "sickness," maybe we should treat it as such consistently. The *first* object of whatever we do is to prevent repeated attacks where they can damage others. That requires, at least, quarantine until the disease is cured—and we'd better make sure our diagnostic tools are sharper than they are now, so we *know* whether it's cured or not. With rabies, at least in principle, you can ascertain the presence or absence of the causative virus. With "criminal sickness," in most cases, nothing so definite has yet been established.

Personally, I have a strong aversion to capital punishment, though people like we're discussing come closer than most to weakening my resistance. Do we really *need* people who methodically but randomly poison strangers, or put needles and blades in Halloween candy? I have my doubts. Even if they are in some sense not responsible for their own actions, they endanger others, consume resources, and contribute nothing. They are, in a word, parasites, and an organism that willingly tolerates parasites in its own body can expect nothing but trouble. Only the remote possibility of "cure"—of transformation into something other than parasites—lends the practice any shred of rationality in this case, and even that sometimes looks pretty flimsy.

Yet my basic reason for opposing capital punishment remains: the likelihood of totally irreversible mistakes with people's lives. That seems to me an extremely serious objection, even in cases like this. "Not so," supporters of capital punishment sometimes tell me, "because our legal system is so full of safeguards that it's virtually impossible for an innocent person to be convicted

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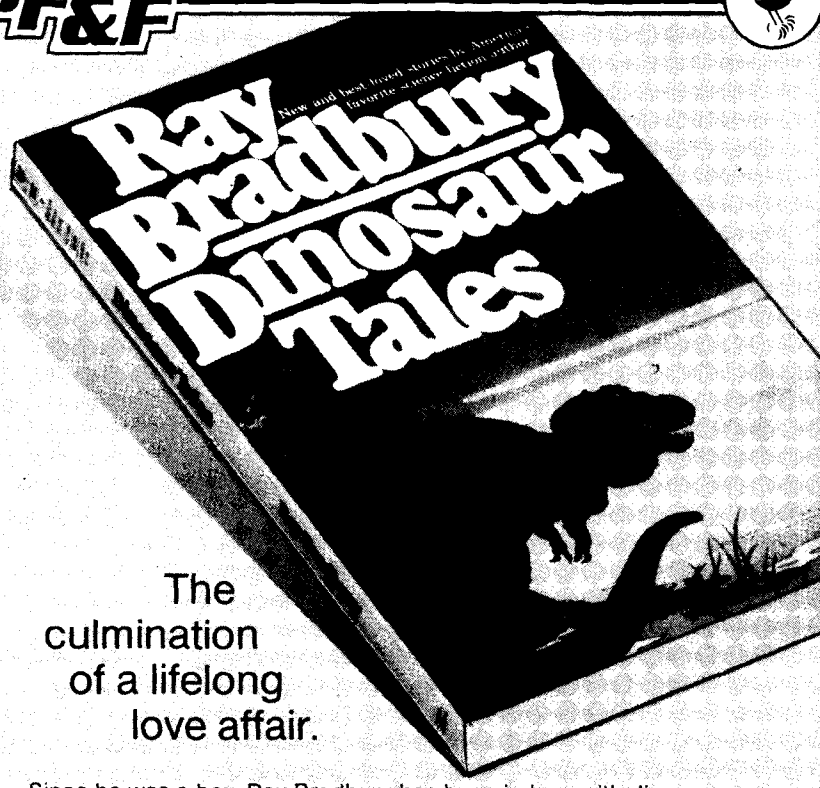

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and sentenced." I wish I could believe that, but I can't. Too many lawyers and law enforcement officers have told me privately that innocent people *do* get sentenced, and guilty ones released, with disturbing frequency. It does happen, and for that reason, even if it doesn't happen very often, we must preserve the ability to repay the uncollected balance of a sentence which turns out to have been a mistake.

So what are the options? We can say homicidal nuts are sick and hope to stay away from them. We can say they're sick and quarantine them, holding out the hope of learning to cure them—while bearing the burden, financial and otherwise, of supporting them. Or we can kill them.

Or we can do none of the above, but instead try to find an approach that eliminates drawbacks and combines advantages of all of the above.

Some of us object to capital punishment because it's so terribly permanent and mistakes can be made which, by definition, are absolutely irrevocable. Some of us object to lifelong imprisonment because it costs a lot to support parasites.

But why should *we* support them, anyway?

Let's turn them into at least marginal symbiotes, whether they like it or not.

The rest of us are expected to support ourselves. Why should prisoners, convicted of the worst kinds of crimes, be rewarded with the unique privilege of being supported by other people? Yes, I know life in prison is not exactly what most people would consider a reward. It shouldn't be. If what's done to people who do commit crimes is supposed to deter others who might, it should be perceived as distinctly unpleasant compared to the alternatives. If you don't have capital punishment, a comfortable form of confinement is hardly a deterringly scary substitute. (One might wonder, in passing, just how effective *any* deterrent really is on an irrationally sick mind.) Even if you don't consider ex-

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isting forms of imprisonment particularly comfortable, they do at least include free room and board, which is something very few *non*-convicts can expect. I'm not suggesting that we go in for medieval or Nazi-style torture chambers, but merely that people who are being kept alive despite having shown themselves so dangerous that they must be isolated should be required to *earn* their sustenance, like the rest of us. They would have to do that on the outside; they should have to do it on the inside, too. Of course, they can't expect much choice about what sort of work they do, and it will probably lean heavily toward jobs that no one else wants. Nor can they expect high pay—but they can expect to keep eating, *if* they do enough productive work to *earn* their room and board (which should be construed as including all operating costs of their residence). If they don't, their rations and accommodations are adjusted accordingly.

Let me emphasize that I'm *not* talking about "make-work" as additional punishment. I'm talking about requiring that the prisoners produce enough goods and services to satisfy some of society's real needs and thereby legitimately earn enough to support their secure lodging and maintenance. There will be those who object that this would increase unemployment on the outside—but bear in mind that these same people would be competing more effectively for better jobs on the outside. We're already beginning to recognize that we're going to have to find ways to redistribute a reduced workload because automation is taking some unpleasant chores off our hands—which, if done right, should prove a blessing to us all. Turning a few more unpleasant chores over to convicts requires essentially the same kind of readjustment and can be handled by similar methods.

There will also be those who say that my proposal is inhumane. One could well question how much humaneness is really due a "human being" who calmly poisons strangers, but I will let that pass and simply question whether it really *is* so inhumane. All I am proposing is that the criminal be subjected to requirements *more* like those routinely imposed on us outside. If he wants to live, he must earn the right. If the work available to him is less appealing or offers less opportunity for advancement than what he could have had outside—well, he had that choice and blew it. He must expect to pay *some* price for taking other people's lives into his own hands. If he finds this sort of life so intolerable that he'd rather starve himself to death, he still has that option. Either way, the people who are being protected outside are relieved of the burden of supporting people of dubious worth and known danger. And the convict who sticks it out retains the hope of a "partial refund" in the event that he is later proved innocent or his "disease" is proved genuinely such and a cure is found. He will *not* be let out for any other reason.

With this system, deterrable potential criminals are deterred, the utter finality of capital punishment is avoided, and the cost of keeping alive those who have already committed crimes is transferred to those who benefit from it.

Worth a try, isn't it? ■

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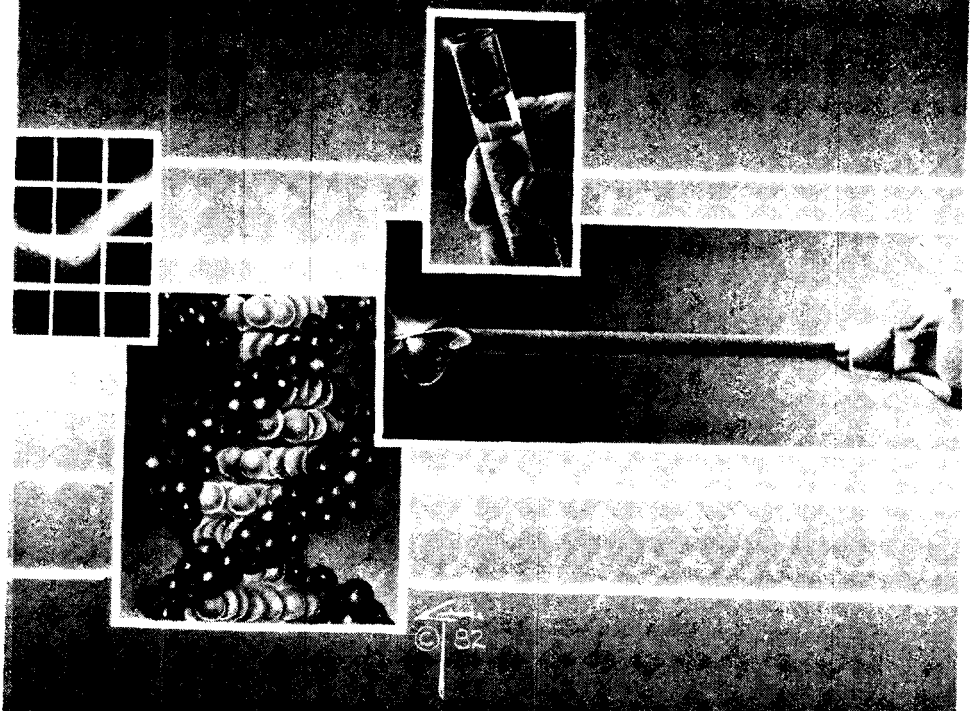
Greg Bear

BLOOD MUSIC



A lot has been speculated about the next step in evolution. But there may come a time when even the evolutionary *mechanism* undergoes a drastic mutation. . . .

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There is a principle in nature I don't think anyone has pointed out before. Each hour, a myriad of trillions of little live things—bacteria, microbes, "animalcules"—are born and die, not counting for much except in the bulk of their existence and the accumulation of their tiny effects. They do not perceive deeply. They don't suffer much. A hundred billion, dying, would not begin to have the same importance as a single human death.

Within the ranks of magnitude of all creatures, small as microbes or great as humans, there is an equality of "elan," just as the branches of a tall tree, gathered together, equal the bulk of the limbs below, and all the limbs equal the bulk of the trunk.

That, at least, is the principle. I believe Vergil Ulam was the first to violate it.

It had been two years since I'd last seen Vergil. My memory of him hardly matched the tan, smiling, well-dressed gentleman standing before me. We had made a lunch appointment over the phone the day before, and now faced each other in the wide double doors of the employee's cafeteria at the Mount Freedom Medical Center.

"Vergil?" I asked. "My God, Vergil!"

"Good to see you, Edward." He shook my hand firmly. He had lost ten or twelve kilos and what remained seemed tighter, better proportioned. At university, Vergil had been the pudgy, shock-haired, snaggle-toothed whiz kid who hot-wired doorknobs, gave us punch that turned our piss blue, and never got a date except with Eileen Termagent, who shared many of his physical characteristics.

"You look fantastic," I said. "Spend a summer in Cabo San Lucas?"

We stood in line at the counter and chose our food. "The tan," he said, picking out a carton of chocolate milk, "is from spending three months under a sun lamp. My teeth were straightened just after I last saw you. I'll explain the rest, but we need a place to talk where no one will listen close."

I steered him to the smoker's corner, where three die-hard puffers were scattered among six tables.

"Listen, I mean it," I said as we unloaded our trays. "You've changed. You're looking good."

"I've changed more than you know." His tone was motion-picture ominous, and he delivered the line with a theatrical lift of his brows. "How's Gail?"

Gail was doing well, I told him, teaching nursery school. We'd married the year before. His gaze shifted down to his food—pineapple slice and cottage cheese, piece of banana cream pie—and he said, his voice almost cracking, "Notice something else?"

I squinted in concentration. "Uh."

"Look closer."

"I'm not sure. Well, yes, you're not wearing glasses. Contacts?"

"No. I don't need them anymore."

"And you're a snappy dresser. Who's dressing you now? I hope she's as sexy as she is tasteful."

"Candice isn't—wasn't—responsible for the improvement in my clothes," he said. "I just got a better job, more money to throw around. My taste in clothes is better than my taste in food, as it happens." He grinned the old Ver-

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gil self-deprecating grin, but ended it with a peculiar leer. "At any rate, she's left me, I've been fired from my job, I'm living on savings."

"Hold it," I said. "That's a bit crowded. Why not do a linear breakdown? You got a job. Where?"

"Genetron Corp.," he said. "Sixteen months ago."

"I haven't heard of them."

"You will. They're putting out common stock in the next month. It'll shoot off the board. They've broken through with MABs. Medical—"

"I know what MABs are," I interrupted. "At least in theory. Medically Applicable Biochips."

"They have some that work."

"What?" It was my turn to lift my brows.

"Microscopic logic circuits. You inject them into the human body, they set up shop where they're told and troubleshoot. With Dr. Michael Bernard's approval."

That was quite impressive. Bernard's reputation was spotless. Not only was he associated with the genetic engineering biggies, but he had made news at least once a year in his practice as a neurosurgeon before retiring. Covers on *Time, Mega, Rolling Stone.*

"That's supposed to be secret—stock, breakthrough, Bernard, everything." He looked around and lowered his voice. "But you do whatever the hell you want. I'm through with the bastards."

I whistled. "Make me rich, huh?"

"If that's what you want. Or you can spend some time with me before rushing off to your broker."

"Of course." He hadn't touched the cottage cheese or pie. He had, however, eaten the pineapple slice and drunk the chocolate milk. "So tell me more."

"Well, in med school I was training for lab work. Biochemical research. I've always had a bent for computers, too. So I put myself through my last two years—"

"By selling software packages to Westinghouse," I said.

"It's good my friends remember. That's how I got involved with Genetron, just when they were starting out. They had big money backers, all the lab facilities I thought anyone would ever need. They hired me, and I advanced rapidly.

"Four months and I was doing my own work. I made some breakthroughs," he tossed his hand nonchalantly, "then I went off on tangents they thought were premature. I persisted and they took away my lab, handed it over to a certifiable flatworm. I managed to save part of the experiment before they fired me. But I haven't exactly been cautious . . . or judicious. So now it's going on outside the lab."

I'd always regarded Vergil as ambitious, a trifle cracked, and not terribly sensitive. His relations with authority figures had never been smooth. Science, for him, was like the woman you couldn't possibly have, who suddenly opens her arms to you, long before you're ready for mature love—leaving you afraid you'll forever blow the chance, lose the prize, screw up royally. Apparently, he had. "Outside the lab? I don't get you."

"Edward, I want you to examine me. Give me a thorough physical. Maybe

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a cancer diagnostic. Then I'll explain more.''

''You want a five-thousand-dollar exam?''

''Whatever you can do. Ultrasound, NMR, thermogram, everything.''

''I don't know if I can get access to all that equipment. NMR full-scan has only been here a month or two. Hell, you couldn't pick a more expensive way—''

''Then ultrasound. That's all you'll need.''

''Vergil, I'm an obstetrician, not a glamour-boy lab-tech. OB-GYN, butt of all jokes. If you're turning into a woman, maybe I can help you.''

He leaned forward, almost putting his elbow into the pie, but swinging wide at the last instant by scant millimeters. The old Vergil would have hit it square. ''Examine me closely and you'll . . .'' He narrowed his eyes and shook his head. ''Just examine me.''

''So I make an appointment for ultrasound. Who's going to pay?''

''I'm on Blue Shield.'' He smiled and held up a medical credit card. ''I messed with the personnel files at Genetron. Anything up to a hundred thousand dollars' medical, they'll never check, never suspect.''

He wanted secrecy, so I made arrangements. I filled out his forms myself. As long as everything was billed properly, most of the examination could take place without official notice. I didn't charge for my services. After all, Vergil had turned my piss blue. We were friends.

He came in late at night. I wasn't normally on duty then, but I stayed late, waiting for him on the third floor of what the nurses called the Frankenstein wing. I sat on an orange plastic chair. He arrived, looking olive-colored under the fluorescent lights.

He stripped, and I arranged him on the table. I noticed, first off, that his ankles looked swollen. But they weren't puffy. I felt them several times. They seemed healthy, but looked odd. ''Hm,'' I said.

I ran the paddles over him, picking up areas difficult for the big unit to hit, and programmed the data into the imaging system. Then I swung the table around and inserted it into the enameled orifice of the ultrasound diagnostic unit, the hum-hole, so-called by the nurses.

I integrated the data from the hum-hole with that from the paddle sweeps and rolled Vergil out, then set up a video frame. The image took a second to integrate, then flowed into a pattern showing Vergil's skeleton.

Three seconds of that—my jaw gaping—and it switched to his thoracic organs, then his musculature, and finally, vascular system and skin.

''How long since the accident?'' I asked, trying to take the quiver out of my voice.

''I haven't been in an accident,'' he said. ''It was deliberate.''

''Jesus, they beat you, to keep secrets?''

''You don't understand me, Edward. Look at the images again. I'm not damaged.''

''Look, there's thickening here,'' I indicated the ankles, ''and your ribs—that crazy zig-zag pattern of interlocks. Broken sometime, obviously. And—''

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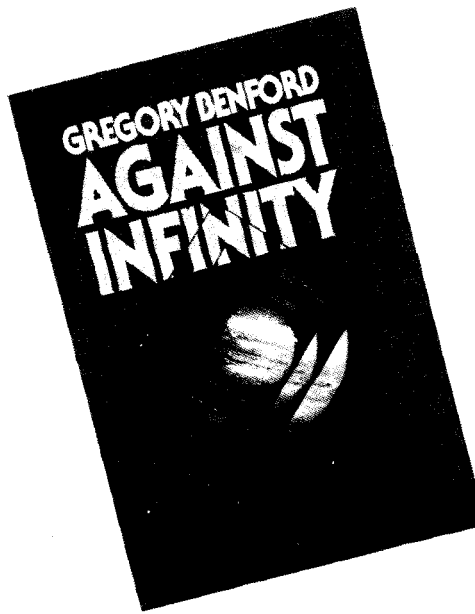

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TIMESCAPE

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"Look at my spine," he said. I rotated the image in the video frame.

Buckminster Fuller, I thought. It was fantastic. A cage of triangular projections, all interlocking in ways I couldn't begin to follow, much less understand. I reached around and tried to feel his spine with my fingers. He lifted his arms and looked off at the ceiling.

"I can't find it," I said. "It's all smooth back there." I let go of him and looked at his chest, then prodded his ribs. They were sheathed in something rough and flexible. The harder I pressed, the tougher it became. Then I noticed another change.

"Hey," I said. "You don't have any nipples." There were tiny pigment patches, but no nipple formations at all.

"See?" Vergil asked, shrugging on the white robe. "I'm being rebuilt from the inside out."

In my reconstruction of those hours, I fancy myself saying, "So tell me about it." Perhaps mercifully, I don't remember what I actually said.

He explained with his characteristic circumlocutions. Listening was like trying to get to the meat of a newspaper article through a forest of sidebars and graphic embellishments.

I simplify and condense.

Genetron had assigned him to manufacturing prototype biochips, tiny circuits made out of protein molecules. Some were hooked up to silicon chips little more than a micrometer in size, then sent through rat arteries to chemically keyed locations, to make connections with the rat tissue and attempt to monitor and even control lab-induced pathologies.

"*That* was something," he said. "We recovered the most complex microchip by sacrificing the rat, then debriefed it—hooked the silicon portion up to an imaging system. The computer gave us bar graphs, then a diagram of the chemical characteristics of about eleven centimeters of blood vessel . . . then put it all together to make a picture. We zoomed down eleven centimeters of rat artery. You never saw so many scientists jumping up and down, hugging each other, drinking buckets of bug juice." Bug juice was lab ethanol mixed with Dr. Pepper.

Eventually, the silicon elements were eliminated completely in favor of nucleoproteins. He seemed reluctant to explain in detail, but I gathered they found ways to make huge molecules—as large as DNA, and even more complex—into electrochemical computers, using ribosome-like structures as "encoders" and "readers," and RNA as "tape." Vergil was able to mimic reproductive separation and reassembly in his nucleoproteins, incorporating program changes at key points by switching nucleotide pairs. "Genetron wanted me to switch over to supergene engineering, since that was the coming thing everywhere else. Make all kinds of critters, some out of our imagination. But I had different ideas." He twiddled his finger around his ear and made theremin sounds. "Mad scientist time, right?" He laughed, then sobered. "I injected my best nucleoproteins into bacteria to make duplication and compounding easier. Then I started to leave them inside, so the circuits could interact with the cells. They were heuristically programmed; they taught themselves more than I pro-

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grammed them. The cells fed chemically coded information to the computers, the computers processed it and made decisions, the cells became smart. I mean, smart as planaria, for starters. Imagine an *E. coli* as smart as a planarian worm!''

I nodded. ''I'm imagining.''

''Then I really went off on my own. We had the equipment, the techniques; and I knew the molecular language. I could make really dense, really complicated biochips by compounding the nucleoproteins, making them into little brains. I did some research into how far I could go, theoretically. Sticking with bacteria, I could could make a biochip with the computing capacity of a sparrow's brain. Imagine how jazzed I was! Then I saw a way to increase the complexity a thousandfold, by using something we regarded as a nuisance — quantum chit-chat between the fixed elements of the circuits. Down that small, even the slightest change could bomb a biochip. But I developed a program that actually predicted and took advantage of electron tunneling. Emphasized the heuristic aspects of the computer, used the chit-chat as a method of increasing complexity.''

''You're losing me,'' I said.

''I took advantage of randomness. The circuits could repair themselves, compare memories and correct faulty elements. The whole schmeer. I gave them basic instructions: Go forth and multiply. Improve. By God, you should have seen some of the cultures a week later! It was amazing. They were evolving all on their own, like little cities. I destroyed them all. I think one of the petri dishes would have grown legs and walked out of the incubator if I'd kept feeding it.''

''You're kidding.'' I looked at him. ''You're not kidding.''

''Man, they *knew* what it was like to improve! They knew where they had to go, but they were just so limited, being in bacteria bodies, with so few resources.''

''How smart were they?''

''I couldn't be sure. They were associating in clusters of a hundred to two hundred cells, each cluster behaving like an autonomous unit. Each cluster might have been as smart as a rhesus monkey. They exchanged information through their pili, passed on bits of memory and compared notes. Their organization was obviously different from a group of monkeys. Their world was so much simpler, for one thing. With their abilities, they were masters of the petri dishes. I put phages in with them; the phages didn't have a chance. They used every option available to change and grow.''

''How is that possible?''

''What?'' He seemed surprised I wasn't accepting everything at face value.

''Cramming so much into so little. A rhesus monkey is not your simple little calculator, Vergil.''

''I haven't made myself clear,'' he said, obviously irritated. ''I was using nucleoprotein computers. They're like DNA, but all the information can interact. Do you know how many nucleotide pairs there are in the DNA of a single bacteria?''

It had been a long time since my last biochemistry lesson. I shook my head.

''About two million. Add in the mod-

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ified ribosome structures—fifteen thousand of them, each with a molecular weight of about three million—and consider the combinations and permutations. The RNA is arranged like a continuous loop paper tape, surrounded by ribosomes ticking off instructions and manufacturing protein chains . . ." His eyes were bright and slightly moist. "Besides, I'm not saying every cell was a distinct entity. They cooperated."

"How many bacteria in the dishes you destroyed?"

"Billions. I don't know." He smirked. "You got it, Edward. Whole planetsful of *E. coli*."

"But they didn't fire you then?"

"No. They didn't know what was going on, for one thing. I kept compounding the molecules, increasing their size and complexity. When bacteria were too limited, I took blood from myself, separated out white cells, and injected them with the new biochips. I watched them, put them through mazes and little chemical problems. They were whizzes. Time is a lot faster at that level—so little distance for the messages to cross, and the environment is much simpler. Then I forgot to store a file under my secret code in the lab computers. Some managers found it and guessed what I was up to. Everybody panicked. They thought we'd have every social watchdog in the country on our backs because of what I'd done. They started to destroy my work and wipe my programs. Ordered me to sterilize my white cells. Christ." He pulled the white robe off and started to get dressed. "I only had a day or two. I separated out the most complex cells—"

"How complex?"

"They were clustering in hundred-cell groups, like the bacteria. Each group as smart as a ten-year-old kid, maybe." He studied my face for a moment. "Still doubting? Want me to run through how many nucleotide pairs there are in a mammalian cell? I tailored my computers to take advantage of the white cells' capacity. Ten billion nucleotide pairs, Edward. Ten E-fucking ten. And they don't have a huge body to worry about, taking up most of their thinking time."

"Okay," I said. "I'm convinced. What did you do?"

"I mixed the cells back into a cylinder of whole blood and injected myself with it." He buttoned the top of his shirt and smiled thinly at me. "I'd programmed them with every drive I could, talked as high a level as I could using just enzymes and such. After that, they were on their own."

"You programmed them to go forth and multiply, improve?" I repeated.

"I think they developed some characteristics picked up by the biochips in their *E. coli* phases. The white cells could talk to each other with extruded memories. They almost certainly found ways to ingest other types of cells and alter them without killing them."

"You're crazy."

"You can see the screen! Edward, I haven't been sick since. I used to get colds all the time. I've never felt better."

"They're inside you, finding things, changing them."

"And by now, each cluster is as smart as you or I."

"You're absolutely nuts."

He shrugged. "They fired me. They

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thought I was going to get revenge for what they did to my work. They ordered me out of the labs, and I haven't had a real chance to see what's been going on inside me until now. Three months."

"So . . ." My mind was racing. "You lost weight because they improved your fat metabolism. Your bones are stronger, your spine has been completely rebuilt—"

"No more backaches even if I sleep on my old mattress."

"Your heart looks different."

"I didn't know about the heart," he said, examining the frame image from a few inches. "About the fat—I was thinking about that. They could increase my brown cells, fix up the metabolism. I haven't been as hungry lately. I haven't changed my eating habits that much —I still want the same old junk—but somehow I get around to eating only what I need. I don't think they know what my brain is yet. Sure, they've got all the glandular stuff—but they don't have the *big* picture, if you see what I mean. They don't know *I'm* in there. But boy, they sure did figure out what my reproductive organs are."

I glanced at the image and shifted my eyes away.

"Oh, they look pretty normal," he said, hefting his scrotum obscenely. He snickered. "But how else do you think I'd land a real looker like Candice? She was just after a one-night stand with a techie. I looked okay then, no tan but trim, with good clothes. She'd never screwed a techie before. Joke time, right? But my little geniuses kept us up half the night. I think they made improvements each time. I felt like I had a god-damned fever."

His smile vanished. "But then one night my skin started to crawl. It really scared me. I thought things were getting out of hand. I wondered what they'd do when they crossed the blood-brain barrier and found out about *me*—about the brain's real function. So I began a campaign to keep them under control. I figured, the reason they wanted to get into the skin was the simplicity of running circuits across a surface. Much easier than trying to maintain chains of communication in and around muscles, organs, vessels. The skin was much more direct. So I bought a quartz lamp." He caught my puzzled expression. "In the lab, we'd break down the protein in biochip cells by exposing them to ultraviolet light. I alternated sunlamp with quartz treatments. Keeps them out of my skin, so far as I can tell, and gives me a nice tan."

"Give you skin cancer, too," I commented.

"They'll probably take care of that. Like police."

"Okay. I've examined you, you've told me a story I still find hard to believe . . . what do you want me to do?"

"I'm not as nonchalant as I act, Edward. I'm worried. I'd like to find some way to control them before they find out about my brain. I mean, think of it, they're in the trillions by now, each one smart. They're cooperating to some extent. I'm probably the smartest thing on the planet, and they haven't even begun to get their act together yet. I don't really want them to take over." He laughed very unpleasantly. "Steal my soul, you know? So think of some treatment to block them. Maybe we can starve the little buggers. Just think on

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it." He buttoned his shirt. "Give me a call." He handed me a slip of paper with his address and phone number. Then he went to the keyboard and erased the image on the frame, dumping the memory of the examination. "Just you," he said. "Nobody else for now. And please . . . hurry."

It was three o'clock in the morning when Vergil walked out of the examination room. He'd allowed me to take blood samples, then shaken my hand —his palm damp, nervous—and cautioned me against ingesting anything from the specimens.

Before I went home, I put the blood through a series of tests. The results were ready the next day.

I picked them up during my lunch break in the afternoon, then destroyed all the samples. I did it like a robot. It took me five days and nearly sleepless nights to accept what I'd seen. His blood was normal enough, though the machines diagnosed the patient as having an infection. High levels of leucocytes —white blood cells—and histamines. On the fifth day, I believed.

Gail was home before I, but it was my turn to fix dinner. She slipped one of the school's disks into the home system and showed me video art her nursery kids had been creating. I watched quietly, ate with her in silence.

I had two dreams, part of my final acceptance. The first that evening —which had me up thrashing in my sheets—I witnessed the destruction of the planet Krypton, Superman's home world. Billions of superhuman geniuses went screaming off in walls of fire. I related the destruction to my sterilizing the samples of Vergil's blood.

The second dream was worse. I dreamed that New York City was raping a woman. By the end of the dream, she was giving birth to little embryo cities, all wrapped up in translucent sacs, soaked with blood from the difficult labor.

I called him on the morning of the sixth day. He answered on the fourth ring. "I have some results," I said. "Nothing conclusive. But I want to talk with you. In person."

"Sure," he said. "I'm staying inside for the time being." His voice was strained; he sounded tired.

Vergil's apartment was in a fancy high-rise near the lake shore. I took the elevator up, listening to little advertising jingles and watching dancing holograms display products, empty apartments for rent, the building's hostess discussing social activities for the week.

Vergil opened the door and motioned me in. He wore a checked robe with long sleeves and carpet slippers. He clutched an unlit pipe in one hand, his fingers twisting it back and forth as he walked away from me and sat down, saying nothing.

"You have an infection," I said.

"Oh?"

"That's all the blood analyses tell me. I don't have access to the electron microscopes."

"I don't think it's really an infection," he said. "After all, they're my own cells. Probably something else . . . some sign of their presence, of the change. We can't expect to understand everything that's happening."

I removed my coat. "Listen," I said, "you have me worried now." The expression on his face stopped me: a

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kind of frantic beatitude. He squinted at the ceiling and pursed his lips.

"Are you stoned?" I asked.

He shook his head, then nodded once, very slowly. "Listening," he said.

"To what?"

"I don't know. Not sounds . . . exactly. Like music. The heart, all the blood vessels, friction of blood along the arteries, veins. Activity. Music in the blood." He looked at me plaintively. "Why aren't you at work?"

"My day off. Gail's working."

"Can you stay?"

I shrugged. "I suppose." I sounded suspicious. I was glancing around the apartment, looking for ashtrays, packs of papers.

"I'm not stoned, Edward," he said. "I may be wrong, but I think something big is happening. I think they're finding out who I am."

I sat down across from Vergil, staring at him intently. He didn't seem to notice. Some inner process was involving him. When I asked for a cup of coffee, he motioned to the kitchen. I boiled a pot of water and took a jar of instant from the cabinet. With cup in hand, I returned to my seat. He was twisting his head back and forth, eyes open. "You always knew what you wanted to be, didn't you?" he asked me.

"More or less."

"A gynecologist. Smart moves. Never false moves. I was different. I had goals, but no direction. Like a map without roads, just places to be. I didn't give a shit for anything, anyone but myself. Even science. Just a means. I'm surprised I got so far. I even hated my folks."

He gripped his chair arms.

"Something wrong?" I asked.

"They're talking to me," he said. He shut his eyes.

For an hour he seemed to be asleep. I checked his pulse, which was strong and steady, felt his forehead—slightly cool—and made myself more coffee. I was looking through a magazine, at a loss what to do, when he opened his eyes again. "Hard to figure exactly what time is like for them," he said. "It's taken them maybe three, four days to figure out language, key human concepts. Now they're on to it. On to me. Right now."

"How's that?"

He claimed there were thousands of researchers hooked up to his neurons. He couldn't give details. "They're damned efficient, you know," he said. "They haven't screwed me up yet."

"We should get you into the hospital now."

"What in hell could they do? Did you figure out any way to control them? I mean, they're my own cells."

"I've been thinking. We could starve them. Find out what metabolic differences—"

"I'm not sure I want to be rid of them," Vergil said. "They're not doing any harm."

"How do you know?"

He shook his head and held up one finger. "Wait. They're trying to figure out what space is. That's tough for them. They break distances down into concentrations of chemicals. For them, space is like intensity of taste."

"Vergil—"

"Listen! Think, Edward!" His tone was excited but even. "Observe! Something big is happening inside me. They

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talk to each other across the fluid, through membranes. They tailor something—viruses?—to carry data stored in nucleic acid chains. I think they're saying 'RNA.' That makes sense. That's one way I programmed them. But plasmid-like structures, too. Maybe that's what your machines think is a sign of infection—all their chattering in my blood, packets of data. Tastes of other individuals. Peers. Superiors. Subordinates."

"Vergil, I'm listening, but I still think you should be in a hospital."

"This is my show, Edward," he said. "I'm their universe. They're amazed by the new scale." He was quiet again for a time. I squatted by his chair and pulled up the sleeve to his robe. His arm was criss-crossed with white lines. I was about to go to the phone and call for an ambulance when he stood and stretched. "Do you realize," he said, "how many body cells we kill each time we move?"

"I'm going to call for an ambulance," I said.

"No, you aren't." His tone stopped me. "I told you, I'm not sick; this is my show. Do you know what they'd do to me in a hospital? They'd be like cavemen trying to fix a computer the same way they fix a stone axe. It would be a farce."

"Then what the hell am I doing here?" I asked, getting angry. "I can't do anything. I'm one of those cavemen."

"You're a friend," Vergil said, fixing his eyes on me. I had the impression I was being watched by more than just Vergil. "I want you here to keep me company." He laughed. "But I'm not exactly alone."

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He walked around the apartment for two hours, fingering things, looking out windows, making himself lunch slowly and methodically. "You know, they can actually feel their own thoughts," he said about noon. "I mean, the cytoplasm seems to have a will of its own, a kind of subconscious life counter to the rationality they've only recently acquired. They hear the chemical 'noise' or whatever of the molecules fitting and unfitting inside."

At two o'clock, I called Gail to tell her I would be late. I was almost sick with tension but I tried to keep my voice level. "Remember Vergil Ulam? I'm talking with him right now."

"Everything okay?" she asked.

Was it? Decidedly not. "Fine," I said.

"Culture!" Vergil said, peering around the kitchen wall at me. I said good-bye and hung up the phone. "They're always swimming in that bath of information. Contributing to it. It's a kind of gestalt thing, whatever. The hierarchy is absolute. They send tailored phages after cells that don't interact properly. Viruses specified to individuals or groups. No escape. One gets pierced by the virus, the cell blebs outward, it explodes and dissolves. But it's not just a dictatorship. I think they effectively have more freedom than in a democracy. I mean, they vary so differently from individual to individual. Does that make sense? They vary in different ways than we do."

"Hold it," I said, gripping his shoulders. "Vergil, you're pushing me close to the edge. I can't take this much longer. I don't understand, I'm not sure I believe—"

"Not even now?"

"Okay, let's say you're giving me the, the right interpretation. Giving it to me straight. The whole thing's true. Have you bothered to figure out all the consequences yet? What all this means, where it might lead?"

He walked into the kitchen and drew a glass of water from the tap, then returned and stood next to me. His expression had changed from childish absorption to sober concern. "I've never been very good at that."

"Aren't you afraid?"

"I was. Now I'm not sure." He fingered the tie of his robe. "Look, I don't want you to think I went around you, over your head or something. But I met with Michael Bernard yesterday. He put me through his private clinic, took specimens. Told me to quit the lamp treatments. He called this morning, just before you did. He says it all checks out. And he asked me not to tell anybody." He paused and his expression became dreamy again. "Cities of cells," he continued. "Edward, they push pili-like tubes through the tissues, spread information—"

"Stop it!" I shouted. "Checks out? What checks out?"

"As Bernard puts it, I have 'severely enlarged macrophages' throughout my system. And he concurs on the anatomical changes. So it's not just our common delusion."

"What does he plan to do?"

"I don't know. I think he'll probably convince Genetron to re-open the lab."

"Is that what you want?"

"It's not just having the lab again. I want to show you. Since I stopped the lamp treatments. I'm still changing."

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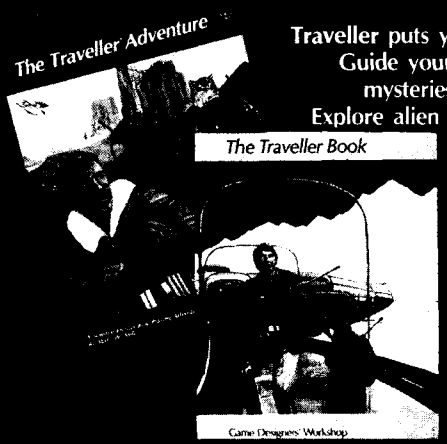

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He undid his robe and let it slide to the floor. All over his body, his skin was crisscrossed with white lines. Along his back, the lines were starting to form ridges.

"My God," I said.

"I'm not going to be much good anywhere else but the lab soon. I won't be able to go out in public. Hospitals wouldn't know what to do, as I said."

"You're . . . you can talk to them, tell them to slow down," I said, aware how ridiculous that sounded.

"Yes, indeed I can, but they don't necessarily listen."

"I thought you were their god or something."

"The ones hooked up to my neurons aren't the big wheels. They're researchers, or at least serve the same function. They know I'm here, what I am, but that doesn't mean they've convinced the upper levels of the hierarchy."

"They're disputing?"

"Something like that. It's not all that bad, anyway. If the lab is reopened, I have a home, a place to work." He glanced out the window, as if looking for someone. "I don't have anything left but them. They aren't afraid, Edward. I've never felt so close to anything before." The beatific smile again. "I'm responsible for them. Mother to them all."

"You have no way of knowing what they're going to do."

He shook his head.

"No, I mean it. You say they're like a civilization—"

"Like a thousand civilizations."

"Yes, and civilizations have been known to screw up. Warfare, the environment—"

I was grasping at straws, trying to restrain a growing panic. I wasn't competent to handle the enormity of what was happening. Neither was Vergil. He was the last person I would have called insightful and wise about large issues.

"But I'm the only one at risk."

"You don't know that. Jesus, Vergil, look what they're *doing* to you!"

"To me, all to me!" he said. "Nobody else."

I shook my head and held up my hands in a gesture of defeat. "Okay, so Bernard gets them to reopen the lab, you move in, become a guinea pig. What then?"

"They treat me right. I'm more than just good old Vergil Ulam now. I'm a god-damned galaxy, a super-mother."

"Super-host, you mean." He conceded the point with a shrug.

I couldn't take any more. I made my exit with a few flimsy excuses, then sat in the lobby of the apartment building, trying to calm down. Somebody had to talk some sense into him. Who would he listen to? He had gone to Bernard . . .

And it sounded as if Bernard were not only convinced, but very interested. People of Bernard's stature didn't coax the Vergil Ulams of the world along, not unless they felt it was to their advantage.

I had a hunch, and I decided to play it. I went to a pay phone, slipped in my credit card, and called Genetron.

"I'd like you to page Dr. Michael Bernard," I told the receptionist.

"Who's calling, please?"

"This is his answering service. We have an emergency call and his beeper doesn't seem to be working."

A few anxious minutes later, Bernard

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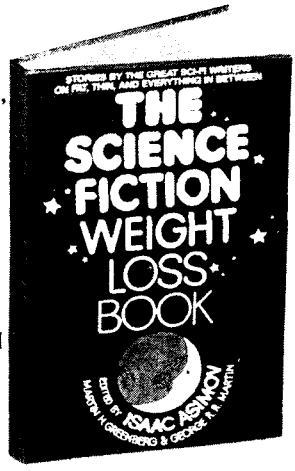

came on the line. "Who the hell is this?" he asked quietly. "I don't have an answering service."

"My name is Edward Milligan. I'm a friend of Vergil Ulam's. I think we have some problems to discuss."

We made an appointment to talk the next morning.

I went home and tried to think of excuses to keep me off the next day's hospital shift. I couldn't concentrate on medicine, couldn't give my patients anywhere near the attention they deserved.

Guilty, anxious, angry, afraid.

That was how Gail found me. I slipped on a mask of calm and we fixed dinner together. After eating, we watched the city lights come on in late twilight through the bayside window, holding on to each other. Odd winter starlings pecked at the yellow lawn in the last few minutes of light, then flew away with a rising wind which made the windows rattle.

"Something's wrong," Gail said softly. "Are you going to tell me, or just act like everything's normal?"

"It's just me," I said. "Nervous. Work at the hospital."

"Oh, lord," she said, sitting up. "You're going to divorce me for that Baker woman." Mrs. Baker weighed three hundred and sixty pounds and hadn't known she was pregnant until her fifth month.

"No," I said, listless.

"Rapturous relief," Gail said, touching my forehead lightly. "You know this kind of introspection drives me crazy."

"Well, it's nothing I can talk about yet, so . . ." I patted her hand.

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"That's disgustingly patronizing," she said, getting up. "I'm going to make some tea. Want some?" Now she was miffed, and I was tense with not telling.

Why not just reveal all? I asked myself. An old friend of mine was turning himself into a galaxy.

I cleared away the table instead. That night, unable to sleep, I looked down on Gail in bed from my sitting position, pillow against the wall, and tried to determine what I knew was real, and what wasn't.

I'm a doctor, I told myself. A technical, scientific profession. I'm supposed to be immune to things like future shock.

Vergil Ulam was turning into a galaxy.

How would it feel to be topped off with a trillion Chinese? I grinned in the dark, and almost cried at the same time. What Vergil had inside him was unimaginably stranger than Chinese. Stranger than anything I—or Vergil—could easily understand. Perhaps ever understand.

But I knew what was real. The bedroom, the city lights faint through gauze curtains. Gail sleeping. Very important. Gail, in bed, sleeping.

The dream came again. This time the city came in through the window and attacked Gail. It was a great, spiky lighted-up prowler and it growled in a language I couldn't understand, made up of auto horns, crowd noises, construction bedlam. I tried to fight it off, but it got to her—and turned into a drift of stars, sprinkling all over the bed, all over everything. I jerked awake and stayed up until dawn, dressed with Gail, kissed her, savored the reality of her human, unviolated lips.

And went to meet with Bernard. He had been loaned a suite in a big downtown hospital; I rode the elevator to the sixth floor, and saw what fame and fortune could mean.

The suite was tastefully furnished, fine serigraphs on wood-paneled walls, chrome and glass furniture, cream-colored carpet, Chinese brass, and wormwood-grain cabinets and tables.

He offered me a cup of coffee, and I accepted. He took a seat in the breakfast nook, and I sat across from him, cradling my cup in moist palms. He was dapper, wearing a gray suit; had graying hair and a sharp profile. He was in his mid sixties and he looked quite a bit like Leonard Bernstein.

"About our mutual acquaintance," he said. "Mr. Ulam. Brilliant. And, I won't hesitate to say, courageous."

"He's my friend. I'm worried about him."

Bernard held up one finger. "Courageous—and a bloody damned fool. What's happening to him should never have been allowed. He may have done it under duress, but that's no excuse. Still, what's done is done. He's talked to you, I take it."

I nodded. "He wants to return to Genetron."

"Of course. That's where all his equipment is. Where his home probably will be while we sort this out."

"Sort it out—how? What use is it?" I wasn't thinking too clearly. I had a slight headache.

"I can think of a large number of uses for small, super-dense computer elements with a biological base. Can't you?

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Genetron has already made breakthroughs, but this is something else again."

"What do you envision?"

Bernard smiled. "I'm not really at liberty to say. It'll be revolutionary. We'll have to get him in lab conditions. Animal experiments have to be conducted. We'll have to start from scratch, of course. Vergil's . . . um . . . colonies can't be transferred. They're based on his white blood cells. So we have to develop colonies that won't trigger immune reactions in other animals."

"Like an infection?" I asked.

"I suppose there are comparisons. But Vergil is not infected."

"My tests indicate he is."

"That's probably the bits of data floating around in his blood, don't you think?"

"I don't know."

"Listen, I'd like you to come down to the lab after Vergil is settled in. Your expertise might be useful to us."

Us. He was working with Genetron hand in glove. Could he be objective? "How will you benefit from all this?"

"Edward, I have always been at the forefront of my profession. I see no reason why I shouldn't be helping here. With my knowledge of brain and nerve functions, and the research I've been conducting in neurophysiology—"

"You could help Genetron hold off an investigation by the government," I said.

"That's being very blunt. Too blunt, and unfair."

"Perhaps. Anyway, yes: I'd like to visit the lab when Vergil's settled in. If I'm still welcome, bluntness and all." He looked at me sharply. I wouldn't be playing on *his* team; for a moment, his thoughts were almost nakedly apparent.

"Of course," Bernard said, rising with me. He reached out to shake my hand. His palm was damp. He was as nervous as I was, even if he didn't look it.

I returned to my apartment and stayed there until noon, reading, trying to sort things out. Reach a decision. What was real, what I needed to protect.

There is only so much change anyone can stand. Innovation, yes, but slow application. Don't force. Everyone has the right to stay the same until they decide otherwise.

The greatest thing in science since . . .

And Bernard would force it. Genetron would force it. I couldn't handle the thought. "Neo-Luddite," I said to myself. A filthy accusation.

When I pressed Vergil's number on the building security panel, Vergil answered almost immediately. "Yeah," he said. He sounded exhilarated now. "Come on up. I'll be in the bathroom. Door's unlocked."

I entered his apartment and walked through the hallway to the bathroom. Vergil was in the tub, up to his neck in pinkish water. He smiled vaguely at me and splashed his hands. "Looks like I slit my wrists, doesn't it?" he said softly. "Don't worry. Everything's fine now. Genetron's going to take me back. Bernard just called." He pointed to the bathroom phone and intercom.

I sat down on the toilet and noticed the sunlamp fixture standing unplugged next to the linen cabinets. The bulbs sat in a row on the edge of the sink counter.

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"You're sure that's what you want," I said, my shoulders slumping.

"Yeah, I think so," he said. "They can take better care of me. I'm getting cleaned up, go over there this evening. Bernard's picking me up in his limo. Style. From here on in, everything's style."

The pinkish color in the water didn't look like soap. "Is that bubble bath?" I asked. Some of it came to me in a rush then and I felt a little weaker: what had occurred to me was just one more obvious and necessary insanity.

"No," Vergil said. I knew that already.

"No," he repeated, "it's coming from my skin. They're not telling me everything, but I think they're sending out scouts. Astronauts." He looked at me with an expression that didn't quite equal concern; more like curiosity as to how I'd take it.

The confirmation made my stomach muscles tighten as if waiting for a punch. I had never even considered the possibility until now, perhaps because I had been concentrating on other aspects. "Is this the first time?" I asked.

"Yeah," he said. He laughed. "I've half a mind to let the little buggers down the drain. Let them find out what the world's really about."

"They'd go everywhere," I said.

"Sure enough."

"How . . . how are you feeling?"

"I'm feeling pretty good now. Must be billions of them." More splashing with his hands. "What do you think? Should I let the buggers out?"

Quickly, hardly thinking, I knelt down beside the tub. My fingers went for the cord on the sunlamp and I plugged it in. He had hot-wired doorknobs, turned my piss blue, played a thousand dumb practical jokes and never grown up, never grown mature enough to understand that he was just brilliant enough to really affect the world; he would never learn caution.

He reached for the drain knob. "You know, Edward, I—"

He never finished. I picked up the fixture and dropped it into the tub, jumping back at the flash of steam and sparks. Vergil screamed and thrashed and jerked and then everything was still, except for the low, steady sizzle and the smoke wafting from his hair.

I lifted the toilet lid and vomited. Then I clenched my nose and went into the living room. My legs went out from under me and I sat abruptly on the couch.

After an hour, I searched through Vergil's kitchen and found bleach, ammonia, and a bottle of Jack Daniel's. I returned to the bathroom, keeping the center of my gaze away from Vergil. I poured first the booze, then the bleach, then the ammonia into the water. Chlorine started bubbling up and I left, closing the door behind me.

The phone was ringing when I got home. I didn't answer. It could have been the hospital. It could have been Bernard. Or the police. I could envision having to explain everything to the police. Genetron would stonewall; Bernard would be unavailable.

I was exhausted, all my muscles knotted with tension and whatever name one can give to the feelings one has after—

Committing genocide?

That certainly didn't seem real. I could not believe I had just murdered

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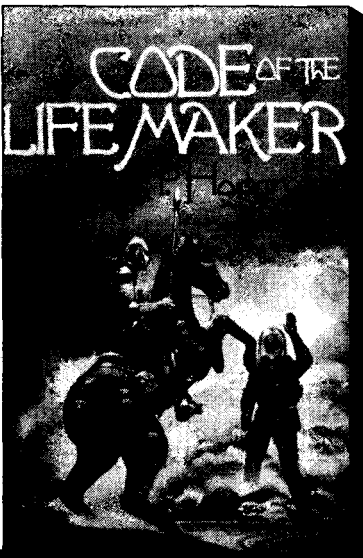

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a hundred trillion intelligent beings. Snuffed a galaxy. It was laughable. But I didn't laugh.

It was not at all hard to believe I had just killed one human being, a friend. The smoke, the melted lamp rods, the drooping electrical outlet and smoking cord.

Vergil.

I had dunked the lamp into the tub with Vergil.

I felt sick. Dreams, cities raping Gail (and what about his girlfriend, Candice?). Letting the water filled with them out. Galaxies sprinkling over us all. What horror. Then again, what potential beauty—a new kind of life, symbiosis and transformation.

Had I been through enough to kill them all? I had a moment of panic. Tomorrow, I thought, I will sterilize his apartment. Somehow. I didn't even think of Bernard.

When Gail came in the door, I was asleep on the couch. I came to, groggy, and she looked down at me.

"You feeling okay?" she asked, perching on the edge of the couch. I nodded.

"What are you planning for dinner?" My mouth wasn't working properly. The words were mushy. She felt my forehead.

"Edward, you have a fever," she said. "A very high fever."

I stumbled into the bathroom and looked in the mirror. Gail was close behind me. "What is it?" she asked.

There were lines under my collar, around my neck. White lines, like freeways. They had already been in me a long time, days.

"Damp palms," I said. So obvious.

* * *

I think we nearly died. I struggled at first, but within minutes I was too weak to move. Gail was just as sick within an hour.

I lay on the carpet in the living room, drenched in sweat. Gail lay on the couch, her face the color of talcum, eyes closed, like a corpse in an embalming parlor. For a time I thought she was dead. Sick as I was, I raged—hated, felt tremendous guilt at my weakness, my slowness to understand all the possibilities. Then I no longer cared. I was too weak to blink, so I closed my eyes and waited.

There was a rhythm in my arms, my legs. With each pulse of blood, a kind of sound welled up within me. A sound like an orchestra thousands strong, but not playing in unison; playing whole seasons of symphonies at once. Music in the blood. The sound or whatever became harsher, but more coordinated, wave-trains finally cancelling into silence, then separating into harmonic beats.

The beats seemed to melt into me, into the sound of my own heart.

First, they subdued our immune responses. The war—and it was a war, on a scale never before known on Earth, with trillions of combatants—lasted perhaps two days.

By the time I regained enough strength to get to the kitchen faucet, I could feel them working on my brain, trying to crack the code and find the god within the protoplasm. I drank until I was sick, then drank more moderately and took a glass to Gail. She sipped at it. Her lips were cracked, her eyes bloodshot and ringed with yellowish crumbs. There

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was some color in her skin. Minutes later, we were eating feebly in the kitchen.

"What in hell was *that?*" was the first thing she asked. I didn't have the strength to explain, so I shook my head. I peeled an orange and shared it with her. "We should call a doctor," she said. But I knew we wouldn't. I was already receiving messages; it was becoming apparent that any sensation of freedom we had was illusory.

The messages were simple at first. Memories of commands, rather than the commands themselves, manifested themselves in my thoughts. We were not to leave the apartment—a concept which seemed quite abstract to those in control, even if undesirable—and we were not to have contact with others. We would be allowed to eat certain foods, and drink tap water, for the time being.

With the subsidence of the fevers, the transformations were quick and drastic. Almost simultaneously, Gail and I were immobilized. She was sitting at the table, I was kneeling on the floor. I was able barely to see her in the corner of my eye.

Her arm was developing pronounced ridges.

They had learned inside Vergil; their tactics within the two of us were very different. I itched all over for about two hours—two hours in hell—before they made the breakthrough and found me. The effort of ages on their timescale paid off and they communicated smoothly and directly with this great, clumsy intelligence which had once controlled their universe.

They were not cruel. When the concept of discomfort and its undesirability was made clear, they worked to alleviate it. They worked too effectively. For another hour, I was in a sea of bliss, out of all contact with them.

With dawn the next day, we were allowed freedom to move again; specifically, to go to the bathroom. There were certain waste products they could not deal with. I voided those—my urine was purple—and Gail followed suit. We looked at each other vacantly in the bathroom. Then she managed a slight smile. "Are they talking to you?" she asked. I nodded. "Then I'm not crazy."

For the next twelve hours, control seemed to loosen on some levels. During that time, I managed to pencil the majority of this manuscript. I suspect there was another kind of war going on in me. Gail was capable of our previous limited motion, but no more.

When full control resumed, we were instructed to hold each other. We did not hesitate.

"Eddie . . ." she whispered. My name was the last sound I ever heard from outside.

Standing, we grew together. In hours, our legs expanded and spread out. Then extensions grew to the windows to take in sunlight, and to the kitchen to take water from the sink. Filaments soon reached to all corners of the room, stripping paint and plaster from the walls, fabric and stuffing from the furniture.

By the next dawn, the transformation was complete.

I no longer have any clear view of what we look like. I suspect we resemble cells—large, flat and filamented cells, draped purposefully across most

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of the apartment. The great shall mimic the small.

I have been asked to carry on recording, but soon that will not be possible. Our intelligence fluctuates daily as we are absorbed into the minds within. Each day, our individuality declines. We are, indeed, great clumsy dinosaurs. Our memories have been taken over by billions of them, and our personalities have been spread through the transformed blood.

Soon there will be no need for centralization.

I am informed that already the plumbing has been invaded. People throughout the building are undergoing transformation.

Within the old time-frame of weeks, we will reach the lakes, rivers, and seas in force.

I can barely begin to guess the results. Every square inch of the planet will teem with thought. Years from now, perhaps much sooner, they will subdue their own individuality—what there is of it.

New creatures will come, then. The immensity of their capacity for thought will be inconceivable.

All my hatred and fear is gone now.

I leave them—us—with only one question.

How many times has this happened, elsewhere? Travellers never came through space to visit the Earth. They had no need.

They had found universes in grains of sand. ■

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Jay Kay Klein's biolog

Authors are often known to complain about how an illustrator misread a story and screwed up a cover illustration. What can an author say to himself when he doubles in brass and gets his own cover all wrong? Greg Bear managed that feat early in his dual writing and illustrating career. He started writing science fiction at age 8, always thinking of himself as a "writer," until at 15 he actually sold a story to a small, now defunct magazine. This ranks with the earliest sales on record, Charles Cloukey having equalled this back in the 1920s and Kenneth Sterling holding the record in the 1930s with a published story at age 12.

Analog held out a few more years, with editor John Campbell bouncing Greg's single-spaced stories. He was gratified to receive Campbell's famous, sprawling signatures on the rejection slips, and whatever words of wisdom the great man would offer. It took ten years of trying to make that first *Analog* sale. And with years and years of writing behind him, it's no wonder that first piece had style and polish. Editor Ben Bova gave "A Martian Ricorso" the lead-off position in the February 1976 issue and a Sternbach cover. Matter of fact, his second appearance also received a cover.

Greg Bear

Photo: Astrid Anderson

Greg was a Navy brat, growing up in Japan, the Philippines, Texas, Rhode Island, and Alaska. He prefers his native state of California, though, and has lived there since 1964. The exotic locales of his childhood have contributed to a sense of the strange and inexplicable, which often appears in his writings—a basic feeling of the poverty, beauty, and history that underlie the lands beyond our borders.

A first novel, *Hegira,* followed closely by *Psychlone* and *Beyond Heaven's River,* proved more rewarding—and writing more demanding—than illustrating, so Greg regretfully cut back to perhaps two paintings a year, just to keep his hand in. His covers have appeared on several of the science fiction magazines, as well as on hardcover and paperback books. Arkham House recently published a short story collection, *The Wind from a Burning Woman.*

He is a reader of fine books, with a fondness for those that are beautifully illustrated and bound. His 6,000-volume library reflects interests in science fiction, fantasy, history, myth, and science. He has been teaching for the past several years on a freelance basis in the San Diego City Schools, lecturing on ancient history, history of science and magic, and science fiction.

Like small-town residents, science fiction fans and writers tend to mingle and marry within the community. Greg is engaged to Astrid Anderson, daughter of writer Poul Anderson. Greg notes that among her many good points is a merciful tolerance for the foibles of a writer's existence. ■

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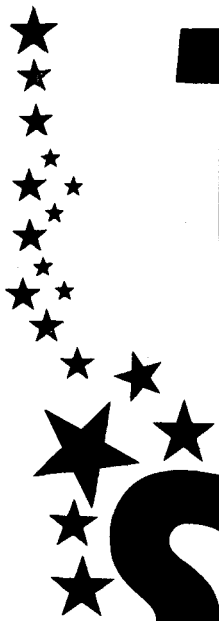

TO THE STARS!

GORDON R. WOODCOCK

Our planetary explorations so far owe a lot to some young science fiction readers who recognized, a few decades ago, that the writers weren't kidding. Well—we're not kidding about the stars, either!

"Space travel is utter bilge"—thus spake Sir Richard van der Riet Woolley, Astronomer Royal of England, in 1956.

This quotation is, in some respects, astonishing. By that date, the United States had announced intentions to launch an Earth satellite in 1957. Dozens of engineering studies of space flight had been published. There was no serious doubt as to eventual technical feasibility of flights to Earth orbit and to the moon and planets. There was only doubt as to when they might be accomplished.

But Dr. van der Riet Woolley was,

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after all, an astronomer. To an astronomer, then even more than now, "space" meant stars and galaxies. I don't agree with his sentiments, but if he meant that *starflight* is utter bilge, his remark is more understandable.

Astronomers are familiar with the vast, dark gulfs of deep space between the stars; they deal routinely with inconceivable distances. Although casual observers of the space travel scene may view starflight as only a modest step beyond trips to the planets in our solar system, it will in fact be inordinately more difficult.

The farthest we have ventured from Earth in manned ships is to our moon, about 400,000 km. This distance, although great compared to the distance we travel on the surface of the Earth, is insignificant compared to interstellar space. The distance to Alpha Centauri, the nearest bright star, is a little more than 40,000,000,000,000 (forty trillion) km. If we make a celestial scale model, with the distance to the moon as one centimeter (about 2/5 of an inch), the distance to Alpha Centauri will be about 1000 km (62 miles). On this scale, the distance to the sun is about 4 meters (13 feet), and the distance to Saturn, 40 meters (130 feet). At Voyager speeds it would take some 50,000 years to reach the nearest star. Skepticism is understandable.

But skepticism is almost certainly wrong. As recently as 1926, rocket flight to the moon was pronounced impossible. A futurist view more consistent with history is that, since starflight is not physically impossible, it is inevitable.

Our star-quest clearly must begin with finding a place to go. A few years ago, it was thought that places had already been found. But the extrasolar planet discoveries of the 1960s seem to have been premature, probably the result of instrument errors. "In light of demonstrations that the suspected perturbations were instrumental in origin, it may be said that *there is no unequivocal evidence for the existence of planets outside the solar system.*" —Project Orion (a NASA study of means of detecting extrasolar planets), NASA SP-436, 1980. The question of places to go, of course, is related to processes of star formation. Again from Project Orion, "An equivalent way of expressing present cosmogonic hypotheses is to say that planetary system formation seems to be a natural, if not inevitable, aspect of the star formation process. The important distinction between the [old] catastrophic and [new] nebular cosmogonic hypotheses is that, if the former is correct, planetary systems are the exception rather than the rule, whereas if the latter is correct, planetary systems are the rule. A systematic study of the frequency of occurrence of planetary systems would thus provide a valuable observational check on present theories of star formation."

Finding a place to go is thus likely to be a byproduct of astrophysical research and need not be justified solely as a prelude to an interstellar flight venture. The question remaining is, "Just how difficult is it?"

There are two ways to find planets orbiting other stars. The first is astro-

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metry: observing the very slight irregularity of motion of a star due to the gravitational effect of its planet(s). The motion to be observed is indeed slight! The irregularity in the Sun's motion, influenced by Jupiter, as seen from the nearest star, would present a perceived waviness in the motion no greater than the width of a softball in New York as observed from Los Angeles.

"With one exception, the telescopes presently used in astrometry . . . are about 60 years old, and only two were designed for high precision astrometric observations. . . . None of the existing instruments are designed . . . for successful detection of very small perturbations." —Project Orion. Project Orion concluded that ground-based astrometry could be improved by more than an order of magnitude and that such improvement would make possible the detection of large (Jupiter-size) planets around stars out to about 100 light-years' distance. This volume of space takes in thousands of stars. The results of such a search would be very significant, both to the theory of star and planet formation and to questions of intelligent life in the universe.

The second way of finding planets is direct observation—that is to say, imaging—with some sort of telescope. Observation will tell us the size or color of an extrasolar planet. Astrometry, on the other hand, will tell us its mass and orbital period. The two schemes are complementary.

It is quite easy to calculate the brightness of a planet circling a distant sun. The result, for stars within ten or so light years from Earth, is on the order of 25th magnitude, a brightness about a hundred million times fainter than the faintest stars seen by the unaided eye, but easily discerned by the largest Earth-based telescopes. "So what's the problem?" one might ask. The problem is the brightness of the parent star. It will be something like a billion times brighter than its planets. Its faint planets will be entirely lost in the blazing glare of the star's image. This is why Earth-based telescopes have never seen extrasolar planets.

If we put a telescope in space, the chances of direct observation improve because the scattering effects of our Earth's atmosphere are avoided. Still, the image of a star in a telescope is not a point, but a smear of light surrounded by rings that become gradually fainter as one looks farther from the central image. At distances expected for planets, the brightness of these surrounding rings will overwhelm the faint planetary images.

Consequently, sophisticated ways to defeat the brightness of the rings have been proposed. One way is apodization: tailoring the reflectivity of the telescope's mirror to minimize the brightness of the rings. Although apodization is theoretically capable of major improvements in the sensitivity of a space telescope for faint planetary images, it requires extreme precision in telescope optics. Alternative schemes include the use of interferometry and of distant occulting disks. These seem to be more practical approaches.

In infrared light, an extrasolar planet will be much brighter relative to its parent star than in visible light, because the

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planet emits infrared light from its own warmth, while the visible light is merely reflected. Infrared wavelengths for best detection, however, are about ten times longer than those of visible light. Consequently, by the laws of optics, ten times greater aperture is needed for the same resolution.

An interferometer simulates a great aperture by simultaneously analyzing the images from two or more smaller apertures coupled together. An interferometer for extrasolar planet detection would spin about its boresight, aimed at the parent star. Images from the two apertures would be combined to null the bright image of the star while expressing the images of any faint planets as oscillating electronic signals at the frequency of rotation of the interferometer. Sophisticated computer analysis methods would yield very high sensitivity for this instrument.

The planetary interferometer space telescope is a rather specialized instrument, ill-suited for other purposes. The occulting disk, however, is an augmentation of an otherwise general-purpose telescope.

One occulting disk concept was proposed by this author about five years ago. The idea is to fly a disk-carrying spacecraft to a great distance from a general-purpose space telescope, in order to blot out the image of a star and make its planets more easily visible. If we select a suitable disk size and distance, the disk will not block the planet's image. Positioning of the occulting disk could be controlled by a laser beam launched from the telescope. Navigating by sensing the laser beam, the disk spacecraft could interpose itself between the star and the space telescope.

One might imagine this to be a nearly foolproof scheme, but because of the diffraction of light it only offers an improvement factor on the order of one hundred. This, however, is enough to make extrasolar planets eminently detectable. We should even be able to detect smaller, Earthlike planets orbiting the nearer stars.

On balance, the finding of planets orbiting the nearer stars doesn't seem so difficult. Several methods have been studied, and all would apparently work. Moreover, there is a strong scientific motivation, unrelated to interstellar travel, to attempt detection of extrasolar planets.

Detection schemes, as presently understood, will be able to distinguish between gas-giant planets and Earthlike planets. They will tell us something about mass, size, color, orbital period, and temperature. But we will see no surface detail. The greatest telescopes imaginable will show us less than we can see of Mars with the naked eye.

However, a technical civilization able to accomplish interstellar travel will be able to survive in any system with Earthlike planets, whether or not they are able to harbor indigenous life. We now imagine ourselves nearly able to eke out a survival in the asteroid belt. Surely, interstellar colonists could do as well.

Places to go, according to present scientific theories of star formation, are plentiful. The progress of space research can be counted on to find a few long before we are ready to engineer a starship.

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"It is certainly out of the question, at our present level of technology or, indeed, at any level we can foresee, to mount an interstellar search [for intelligent life] by spaceship." —*The Search for Extraterrestrial Intelligence*, NASA SP-419, 1977. At any level we can foresee? Let's try some foreseeing:

First, just how tough is it? Science fiction long ago created the three themes presently known for starflight: fly slow (the generation ship), fly fast (the relativistic ship), and fly tricky, invoking some sort of spacewarp or fifth-dimensional "jump." The third scheme relies on a physics presently unknown, but the first two depend only on our ability to apply energy and power to surmount the barriers of time and distance.

We need *both* high energy and a high power-to-weight ratio to travel to even the nearest star in a "reasonable" time. High energy will give us enough rocket jet velocity to attain the speed needed to cross interstellar distances in reasonable time. Only with high power-to-weight can we accelerate to our speed in a reasonable time.

"How high is high?" is the obvious question. Ordinary rockets powered by chemical fuels have plenty of acceleration but far too little energy (specific impulse). Nuclear-powered electric rockets could achieve enough jet energy, but are limited to low acceleration by the complexity and weight of their power conversion cycles. The nuclear energy, released as heat, must be changed into electrical power to operate an ion engine. Electric rockets, however powered, confront us with the old nemesis of space propulsion engineering: power conversion cycles. Always heavy and complex, they are usually inefficient as well. I once read an article describing an electric ion engine as "The Star Engine." Maybe, if one accepts a trip time of a thousand years or more!

We have to find a way to express nuclear energy directly as jet energy. Fusion reactor concepts offer fascinating possibilities. A magnetic-containment fusion reactor (assuming we can get one of these to work) will be a magnetic "bottle" of very hot plasma. All we must do is provide a controlled leak in the bottle, so that the plasma gradually leaks out in a particular direction, producing a high-energy jet. The leaky bottle is replenished by fresh fusion fuel. Specific impulses ranging from a few thousand to as much as a million seconds have been projected by various investigators. Power-to-weight ratios as high as 10 to 100 kilowatts per kilogram might be reached, but we must first resolve a two-fold problem.

The typical magnetic-containment fusion reactor concept begins with an evacuated chamber, usually doughnut-shaped, in which the reaction takes place. The wall of this chamber, the "first wall," must be vigorously cooled so that it will not be vaporized by the storm of radiation emanating from the reaction. This wall is surrounded by a "lithium blanket," actually a container filled with liquid lithium metal. Part of the reaction—the fusion of deuterium and tritium atoms into helium—occurs in the evacuated doughnut. About three-fourths of the energy released comes off as very high-energy neutrons. These are

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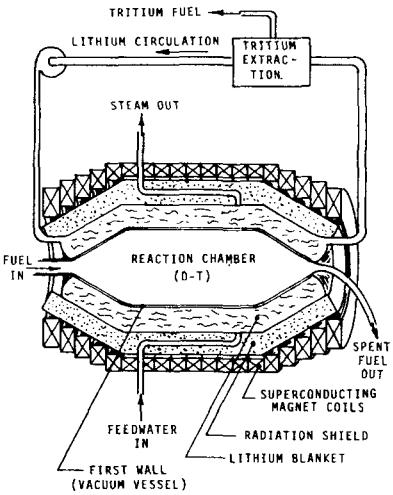
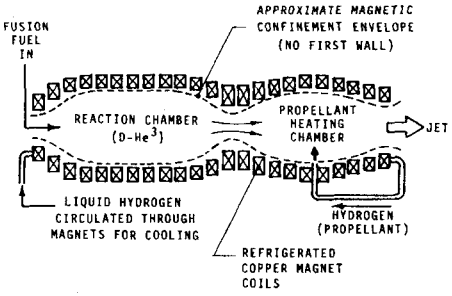


FUSION POWER REACTOR SCHEMATIC DIAGRAM



FUSION PROPULSION REACTOR SCHEMATIC DIAGRAM

FUSION POWER REACTOR CONCEPTS

Fusion power reactor concepts for power and for propulsion are contrasted in this diagram. For simplicity, I have used a magnetic mirror geometry, although actual reactors will probably use a more complex geometry such as the Tokamak.

The power reactor includes a "first wall" vacuum vessel that maintains the high vacuum needed for the reaction; a lithium blanket in which tritium is regenerated; and superconducting magnets for confinement of the reaction. Power is extracted as heat from the lithium blanket. The heat boils water to run steam generators.

A rocket reactor may employ copper magnets cooled to cryogenic temperatures by liquid hydrogen. The hydrogen, after cooling the magnets, would be used as reaction mass for the rocket. It is assumed that this reaction runs on deuterium and helium-3. No blanket is needed. Neither is a first wall, because the natural vacuum of space will suffice.

The energy of particles leaking from the reaction may be too high, depending on the mission. If we want to trade jet velocity for higher thrust, a second magnetic bottle can be used to redistribute the energy of the reaction products to hydrogen propellant.

absorbed in the blanket, converting its lithium into tritium and helium. The blanket is necessary because natural tritium is very scarce; tritium used inside the reactor must be replenished from the blanket.

Outside the blanket are superconducting magnets that create the magnetic bottle. These must be refrigerated to about 5 degrees K (about 450 degrees below zero Fahrenheit). If the fusion reactor is to be used for utility electric power generation (the present objective of the fusion power research program), the energy from the reactor will be taken

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from the lithium blanket as heat to make steam to run generators.

So we are still confronted by our space-propulsion nemesis: power cycles. The first generates electricity from the heat of the fusion reaction; the second cools the superconducting magnets. We have to get rid of these if we are to have a useful fusion star drive.

For a star-drive, we can remove the lithium blanket. This gets rid of a major heat source. We could make tritium on Earth in fusion reactors to fuel our starship. The short half-life of tritium, 12 years, is a problem for a starship whose travel time may be several times this, but the decay of tritium into helium-3 may be a blessing in disguise, as we shall see.

We should also get rid of the superconducting magnets and, as proposed by Dr. Robert Bussard, use magnets cooled by the engine's fuel flow.

We could do even better by using a different fusion reaction. There are at least three from which to choose: deuterium/helium-3, deuterium/deuterium, and boron/hydrogen, listed in order of ignition difficulty. The first of these is almost as easy to ignite as deuterium/tritium, but there is essentially *no* helium-3 on Earth. It will, however, be a byproduct of a fusion power program because of the decay of tritium. Thus a fusion energy economy on Earth could make starship fuel. There is doubt, however, that it could make enough. If we began to save up helium-3 when the first fusion reactor went on line, there still might not be enough for even the first starship. These ships will generate enormous power and have a great appetite for fusion fuel.

That is why the British Interplanetary Society, in its study of a fusion-powered star probe, proposed that helium-3 be obtained from the atmosphere of Jupiter. Unlike Earth, Jupiter still has its primordial atmosphere of hydrogen and helium; about 0.006% of the primordial mixture is helium-3, according to astrophysicist Fred Hoyle. This seemingly small amount is enough to make scooping up Jupiter's atmosphere from an orbiting ship very profitable. The power available, from fusion of scooped-up helium-3 and deuterium, to a "Jupiter-scoopiter" would be something like thirty times that needed to maintain its orbit in the face of the scooping drag.

The deuterium/helium-3 reaction produces relatively few neutrons, and would greatly reduce neutron heating. The deuterium/deuterium reaction produces about one-fourth as many neutrons as the deuterium/tritium reaction, but is roughly ten times harder to ignite. The boron/hydrogen reaction produces no neutrons, but may be too hard to ignite ever to be used in a magnetic bottle reactor. Deuterium, boron, and hydrogen, of course, are all plentiful.

Star-drive reactors will have to be far more powerful than any yet conceived. At very high powers, new reactor types might be contemplated. One such is a pellet-collision scheme. Electromagnetic accelerators would fire small pellets of boron hydride at one another, at speeds of hundreds of kilometers per second. The high temperatures and densities produced by the collision would

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ignite the fusion reaction. A magnetic rocket nozzle would direct the jet. Maybe the now-defunct program of the 1950s to develop boron hydride missile fuels was strangely prescient!

Still more powerful star drives might be contrived from matter-antimatter engines. Anti-hydrogen can be made from positrons (anti-electrons) and anti-protons. The former were discovered in the 1930s, and antiprotons were first isolated in 1955. Plans are now being discussed for containment of up to a trillion antiprotons in a storage ring for physics experiments. One fine day, we will undoubtedly be able to create and store anti-hydrogen, or anti-helium, or whatever. This, of course, will be sporty, inasmuch as any form of antimatter will annihilate ordinary matter upon contact! We will have to find a storage scheme that somehow suspends the antimatter fuel without its coming into contact with anything.

The payoff is that the matter-antimatter reaction will be able to convert mass into energy at more than 50% efficiency, whereas fusion is less than 1% efficient. This is the best star-drive that presently known physics can prescribe: an annihilation engine, powered by a matter-antimatter reaction. Such a drive might approach lightspeed. Built large enough, an annihilation engine might attain high thrust and yield a star-drive able to shorten star trips by relativistic time dilation. We are now speculating rather than forecasting, of course. No one has published a design for an annihilation star-drive, but this is clearly the ultimate that presently understood physics has to offer.

What might a starship be like? Probably rather like one of Gerard K. O'Neill's space colonies. Imagine that we have found a planetary system orbiting a suitable nearby star. We know there are some Earth-size planetary bodies, but we don't know much about them. Colonies and bases on the moon, Mars, and some of the moons of Jupiter and Saturn have taught us to survive on inhospitable worlds. We are confident that if we can get there, we can survive.

Survival, however, depends on perpetuation of a high-technology society. We must take along enough skills and knowledge to operate, repair, rebuild, replicate, and improve all of the machinery and equipment we need to live and prosper, perhaps on a moonlike body. And our raw materials are likely to be undifferentiated rocks, not high-grade ores. How many people do we need to embody all the skills? Remember, no help from home! Today, my guess is about ten thousand. In the future, developments in robotics might reduce the number, but it will still be large.

One thing we will surely do is listen before we leap. We would not wish to arrive in a distant planetary system only to find we were not welcome. If indigenous intelligent civilization is present, careful listening with large radio telescopes will reveal it by detecting "leakage" of electro-magnetic signals such as radio or radar, even if these are not meant for interstellar communication. And we should not chance that an apparent welcome at departure time will last until arrival. Imagine a Japanese

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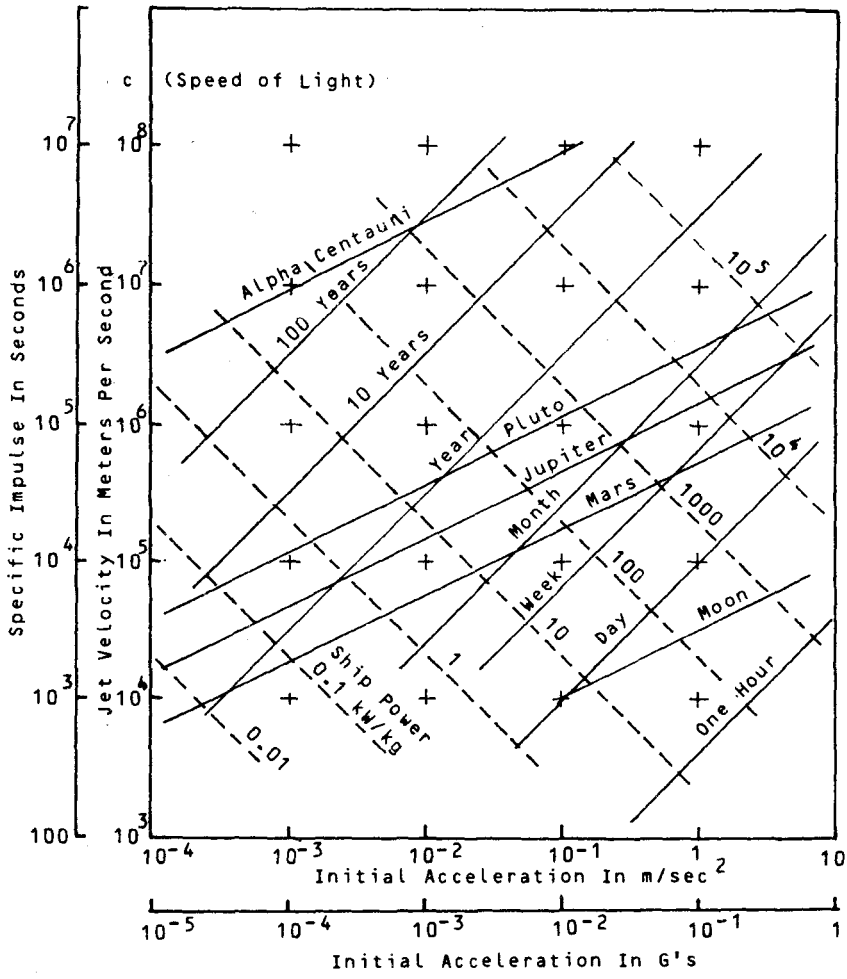

SPACESHIP PERFORMANCE MAP

Calculating the performance of a spaceship can be complicated. But if the ship is powerful enough, we can ignore gravity fields. It is then fairly easy. The ship will accelerate to a maximum speed and then turn around and slow down at its destination. Fusion or annihilation-drive ships will probably do this. They will apply power all the time, speeding up and then slowing down.

In this simple case, all the important performance parameters can be expressed on a single graph. This one is drawn for the case when 90% of the starting mass is propellant. Jet velocity and starting acceleration are the graph scales. Distances for several bodies are shown. Mars varies greatly; I used 150 million km. Trip times and

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expedition to the United States departing in 1903 for arrival forty years later. Things change.

Our starship will probably gross on the order of a million metric tons and be something like a thousand meters (eleven football fields) in length. A triangular wedge shape similar to the empire ships in *Star Wars* will minimize the damage from hitting anything at high speed. Let's hope we don't hit anything bigger than a grain of sand. At 0.1c, a collision with a pea-sized pebble would release as much energy as a small atom bomb.

The star drive will provide artificial gravity, perhaps a tenth of a "g," onboard the ship. Our program will be to accelerate until we are halfway there, then turn around and decelerate the rest of the way. If we are to travel ten light-years, accelerating at 0.1g, our maximum speed will be about 0.15c and the trip will take 130 years. If our star-drive has a specific impulse of a million seconds and a billion newtons (about 200 million pounds) of thrust for our 0.1g, its power will be several billion megawatts. This is about a thousand times the present total energy consumption of the United States. Such huge numbers sound like they come from a government budgeteer, but these are the awesome statistics of starship engineering as we now know it. Ah, for even the glimmer of an idea how to pull off the spacewarp trick!

If we have some ideas as to "how," then we are surely allowed to ask "when." The "when" of starflight may be more an economic question than a technical one. If we had the technology to build it, our million-ton ship would likely cost a trillion dollars. Such a proposal will never get by Senator Proxmire.

Further, when starships first become possible, the expected trip time will be twenty to one hundred years. The return on an investment, i.e., to Earth, will be nil. What will motivate the spending of huge sums on such an enterprise?

Our society today is willing to make huge investments only if a near-term payback is expected or if some urgent need, such as "war on poverty" or national security, is served. What the U.S. government spends on social causes, including social security, would pay for a trillion-dollar starship in three years; what it spends on defense, in about five. At the present NASA spending rate,

specific power levels are also shown. "Specific power" expresses how much power the ship generates for each kilogram of its mass, i.e., its total power divided by its mass. The propellant the ship will carry is not included in the mass value.

An example: Suppose your ship can produce 100 kW/kg of jet power. You wish to fly to Jupiter. Where the 100 kW/kg and Jupiter lines cross on the graph, read a jet velocity of 300,000 m/sec (Isp = 30,000) and an initial acceleration of nearly 0.01g. Your trip will take about two months.

The upper area of the graph shows that high performance is needed to reach the nearest stars. Even generation ships will need, in addition to very high jet velocities, power on the order of 100 kW/kg. The space shuttle orbiter produces about 100 kW/kg with its three engines. The high power needed for starflight precludes its attainment with means such as electric propulsion.

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however, it would take 160 years to pay for the starship!

This short-sighted attitude toward investment in scientific or cultural advancement seems to stem from a "Harvard Business School" outlook. If one evaluates investments with a discount rate of ten percent or more, anything that takes more than ten or fifteen years to mature is worthless. (Yet, for some reason, we keep on having children.) As usually practiced, the Harvard Business School approach is not even good economics, since it ignores indirect benefits such as technical advancements; these are often of more value than the direct benefits.

Ever since discounting became popular for investment analysis in the mid 1960s, our technological and cultural advancement has been slowed. But it was not always thus. The great cathedrals of Europe were constructed over generations. The U.S. interstate highway program has taken about thirty years. One wonders how long the pyramids of Egypt took, and what percent of Egypt's gross national product they consumed.

We shouldn't be too pessimistic. Starship technology is probably at least fifty years in the future. It may be as far in the future as the clipper ships are in the past. Our ability to fund epic projects continues to advance as our economy grows. At an annual growth rate of three percent, our economy will multiply by a factor of twenty in 100 years. A starship project will not be too staggering to contemplate. It will, in fact, be less of a fiscal challenge than was Project Apollo in 1961.

Some will argue about "limits to growth" and all that. Indeed, the finiteness of Earth's resources will force us into space if we are to maintain economic progress. The industrialization and colonization of the solar system will surely bring about great cultural changes in our society. It's difficult to guess exactly what they will be, but I would bet they will improve the social acceptability of a starship project.

Now that we can begin to sketch the outlines of engineering starships, we are naturally drawn to questions about alien interstellar travelers. In the 1950s, and especially in the 1960s, the popular scientific view held that the universe is teeming with life, presumably intelligent. Radio telescopes listened for artificial signals from planetary systems of other stars. Discovery was announced of one or more planets orbiting Barnard's Star. Primitive life on Mars was almost accepted as fact. Enrico Fermi, anticipating a later view by about twenty years, asked, "Where are they?"

The United States once regarded the Atlantic Ocean as a protective barrier. Similarly, the great gulfs between the stars have been viewed until recently as a barrier to starflight. Discovery of intelligent life elsewhere in the universe, even though of enormous philosophical and scientific importance, was seen strictly as an academic matter and not one of practical concern.

In the last few years, all this has begun to change. The key development has been Gerard O'Neill's proposals for self-sufficient space colonies. Fitted with a fusion propulsion system, such

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a colony might become a "generation starship," i.e., a ship capable of reaching the stars in a few generations of life aboard. Starflight by this means is no longer merely fanciful science fiction but technically conceivable.

Has intelligent life arisen somewhere else in the galaxy? Even if it spread only at a speed of 0.01c, such an intelligence could colonize the entire galaxy in two to three million years. This is about the length of time that manlike hominids have lived on Earth, an exceedingly short time in the history of the galaxy. 0.01c is one one-hundredth the speed of light. A fusion-propelled ship should easily exceed 0.01c; 0.04 to 0.05c is a more likely estimate. If we presume that hundreds of years are spent at each new stellar beachhead, to regroup and gather strength for the next leap across the dark reaches of interstellar space, a spreading velocity of 0.01c is quite believable. Indeed, where are they?

Recognition that construction of a starship may be possible with foreseeable extensions of our technology, coupled with a distinct lack of alien visitors, seems to be swinging scientific opinion toward doubting the occurrence of life elsewhere in the universe. Perhaps we are alone! Recently it has been speculated (*Science News*, June 20, 1981) that supernova explosions within the galaxy, or its central core, have prevented intelligent life from developing by spraying lethal doses of radiation throughout space. Earth is imagined to have escaped by fortuitously having been in the protective envelope of a galactic spiral arm during each lethal period.

Indeed, "Where are they?" If we can, why haven't "they,"—some other intelligent civilization—achieved starflight? And why aren't they here or, at least, why haven't they been here and left some record? Of course, many people believe they *are* (UFOs) or have been ("ancient astronauts"). But the evidence for either of these views is hardly convincing. At least, I am not convinced!

One can think of dozens of reasons why an advanced civilization, spreading through the galaxy, would have bypassed Earth. Even so, current scientific opinion is veering away from the "teeming with life" views of the 1960s.

If starships are big and expensive, as I suspect, it is likely that they don't pass this way very often. Perhaps every few million years. And why didn't "they" land here and colonize? "Star Trek" had an answer: the "prime directive." Don't interfere with indigenous life or cultures. Maybe the spaceship phase of technical and cultural development is only transitory. How about teleportation? Or some sort of super-sensory means of communication such that there simply is no reason to travel? For that matter, maybe "they" will land tomorrow. The fact that we do not have alien visitors proves neither (a) that aliens don't exist, or (b) that star travel is impossible.

I don't suppose I can avoid some sort of speculation on the spacewarp trick. Of course, it has no basis in known science. And scientists are forever acting as if they know all there is to know about the universe. That was certainly true about 1890. There was actually serious scientific opinion back then that no more

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basic science remained to be discovered. We knew all there was to know! There have been, since then, about three revolutions in physics. Relativity and quantum mechanics are the biggies, and solid-state physics has had a profound impact on almost everyone's life. The pocket calculator lying on my desk could only have been explained as "magic" as recently as the 1940s.

We are apparently in the midst of another revolution in physics. The "gauge theories" of particle physics are coming close to Einstein's dream of a unified field theory, a single theory that explains all of the forces of nature. They even offer an explanation as to why antimatter is apparently very scarce in the universe.

These theories, in their present state, with all the stuff about colored and charmed quarks, are mainly mechanistic. They are like Kepler's elucidation of planetary motion. He discovered that planets move in ellipses, and that an imaginary line between the planet and the sun sweeps equal areas in equal times, and so forth. But it remained for Newton to propose gravity as an explanation and interpretation of Kepler's facts.

Similarly, the trappings of relativity, the constancy of lightspeed, the Lorentz-Fitzgerald contraction (it isn't named for Einstein!) were mostly known before Einstein offered his profound philosophical interpretation, with its awesome insight to the equivalence of matter and energy.

We await another great philosopher-interpreter, to transform the multitude of discoveries in particle physics and cosmology of the last twenty or so years into a new synthesis, a new and deeper explanation of the mysteries of nature. Out of his (her?) work may emerge the secret of star travel without strain and pain. Otherwise, we will just have to use brute force and high-energy propulsion.

If our human civilization does survive its near-term crises of militarism, nationalism, and resource exhaustion, we will soon move out into the solar system. And we will eventually build starships. Our first starship will not be our last. ". . . several bright sources such as quasar 3C273 are famous for having high-speed jets protruding out one side." —*Science News,* August 15, 1981. It sort of makes you wonder. ■

● Science no longer holds any absolute truths. Even the discipline of physics, whose laws once went unchallenged, has had to submit to the indignity of the Uncertainty Principle. In this climate of disbelief, we have begun to doubt even fundamental propositions, and the old distinction between natural and supernatural has become meaningless.

Lyall Watson, *Supernature*

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The Alternate View

SOMETHING'S STRANGE IN THE SYSTEM

G. Harry Stine

There are some things about the solar system that don't quite seem right.

These may not be anomalies after all, but merely consequences of the fact that we're very new at this business of exploring the universe. Everything we now see as anomalies or circumstantial coincidences may actually be commonplace. One must remember that truth is usually stranger than fiction (but often doesn't get the same word rates), and that our feeble imaginations have, in the past, proven to be extremely conservative when compared to what we finally learned to be fact. We see the universe through a veil of fearful ignorance.

After all, we have a very distorted view of the way the universe works. This is because we evolved on a planet where the surface conditions are *exceedingly* different from the environment of the rest of the universe. Planet Earth possesses a thick oxidizing atmosphere with sufficient pressure and temperature to permit the existence of water in all three phases—vapor, liquid, and solid. In comparison to the conditions in the rest of the universe, this represents a very narrow band of pressure and temperature indeed. This is the only planet in the solar system (for all we know, in the entire universe) where conditions are *just right* for this to happen.

If the water isn't enough of a unique feature, Planet Earth also possesses a strong magnetic field that traps most of the ionizing radiation from the solar wind and presents us with a beautiful phenomenon known as the aurora. Another fascinating piece of data: The composition of the Earth's atmosphere is such that solar energy produces ozone at about 75,000 feet, thereby shielding the planetary surface from most of the intense ultraviolet light from the sun, radiation of such energy that it can harm carbon-based organic matter.

If a science fiction writer deliberately were to design a weird and unusual planet as the background for a story, chances are it wouldn't turn out as weird and unusual as Earth actually is.

Furthermore, the more data we get from the rest of the universe, the more weird and unusual our planet becomes.

Planet Earth may not be unique, when all the data's in. The chances are good that we'll eventually discover other planets around other stars that possess some or all of Earth's environmental characteristics. However, even if we grant the assumption that Earth is somehow unique in the solar system but representative of other terrestrial-type planets in the galaxy, we're still faced with some very strange and coincidental as-

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tronomical facts right in our own back yard.

For example: In the solar system, the moon is the largest satellite in comparison to its primary—that is, the moon is larger with respect to the Earth than any other satellite is to the planet it orbits. The Earth-Moon system is *almost* a double planet. The moon is close enough and large enough that we can see features on its surface with modest optical instruments constructed with primitive technology. The concepts of other objects in the sky being worlds like Earth, and traveling to worlds beyond our own, are based upon the fact that we can see the moon as another world, not just a point of light moving through the skies like an errant star.

Another fascinating fact: The size of the moon, the distance between the Earth and the moon, the distance between the Earth-moon system and the sun, and the size of the sun just happen to create a geometry that permits the moon to *exactly* cover the disk of the sun and reveal the corona during a solar eclipse. I don't know whether or not we could figure the odds on this happening by chance, but they must be huge. But without the solar eclipse phenomenon, we might not have recognized the sun as a star.

The aurora was mentioned earlier as a consequence of the interaction between the Earth's upper atmosphere and solar wind particles trapped in the Van Allen belts by the terrestrial magnetic field. Although this phenomenon has been observed on Jupiter, Earth appears to be unique among the rocky inner planets in possessing all the prerequisites for an aurora to happen. When scientists first measured the height of the aurora, it gave them a handle on the upper atmosphere and led to the development of theories behind magnetohydrodynamics.

The terrestrial magnetic field and its Van Allen belts also keep nearly all of the ionizing radiation from solar flares from reaching the surface of the Earth. Such ionizing radiation is considered to be hazardous to your health. Organic life on Earth would certainly be quite different without that magnetic field. Or maybe it's different because of the magnetic field.

Take Mars (if you want it). Here's another planet whose disk can be resolved with a modest optical instrument. My 4-inch f/10 Newtonian reflector does it just fine with a 7-mm. eyepiece. We can see polar caps like those of Earth. We can see strange, changing markings on its surface. We can see clouds and dust storms moving across the disk. Yet the planet is just far enough away to prevent us from getting all the answers by telescopic means. The size and orbit of Mars tell us that it could be semi-Earthlike; yet again, it can't possibly be. When we sent robot explorers there to look and measure, they reported rivers without water. The automated biological laboratories that were landed on the surface by the robots sent back data which, if it had come from the same laboratories landed anywhere on Earth, would have been construed as detecting some manner of living organisms. Mars turned out to be tantalizing. But it appears that we're going to have to go there ourselves to find out for sure. However, getting to the moon was relatively easy in comparison with getting

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to Mars, a project that will require, among other things, the development of closed-cycle ecological life-support systems, which will in turn lead to human independence of Earth's biosphere.

Venus: about the same size as Earth, but closer to the sun and perpetually cloud-shrouded. It's an enigma that tweaked our curiosity and led us to send other robot explorers, which have reported a reducing atmosphere and a humongous greenhouse effect. Although we have the technology now to eke out a living on Mars, it will take another quantum jump in technology to permit human beings to live on Venus. But big questions remain: Why is Venus so much like Earth and yet so different?

Once we'd accumulated anough observational data on the orbits of the planets in the solar system, a strange regularity became evident. In 1772 Johann Elert Bode (1747-1826) published an empirical formula expressing this which, although it's known as Bode's Law, was actually discovered by the German mathematician J.D. Titius (1729-1796). Using the numerical series 0, 3, 6, 12, 24, and so on, doubling the number successively in this series, add 4 and divide the sum by 10. If Earth's distance from the sun is equated to unity, Bode's Law becomes an empirical expression for the mean distance from each planet to the sun. There are three exceptions: Neptune, Pluto, and the planetoid belt (where there should be a planet but a whole one doesn't exist). Bode's Law doesn't hold true unless the Earth's distance from the sun—93 million miles or one Astronomical Unit—is equated to unity. Is this unique? Does something like Bode's Law hold true in other planetary systems? Is Bode's Law a consequence of some basic universal gravitational phenomenon, or are its special numbers examples of a mathematical factor known as an eigenvalue? It's telling us something. What?

Richard C. Hoagland's article, "The Blivit in the B-Ring," (*Analog*, December 1982 and January 1983) indicates that, as we take closer looks at the solar system, we're going to find other strange and circumstantial things.

There are enough of these circumstantial, coincidental facts that one could almost be led to believe that the solar system was *designed* to lead us, step by step, up a stairway of growing scientific data toward the stars.

It certainly looks suspicious, doesn't it?

In my library I have a number of astronomy books, one of which dates back to 1905. This volume is totally obsolete even when it comes to the values for planetary orbits. *All* my astronomy books are rapidly becoming obsolete. Even one published as recently as 1964 in which a series of mysteries of the universe were detailed is now more than 75 percent obsolete. The only features of that book remaining valid today are the questions about stellar astronomy and extraterrestrial life. I suspect that all of those mysteries are going to be solved within the lifetimes of most of us and be replaced with new mysteries formed by new questions posed by the new information we get.

In the meantime, there are some nagging inconsistencies. Something's strange in the system. ■

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Emmet Nolan turned and shook hands with Paul Dobson, the big, affable chief warrant officer who'd flown him over by helicopter from the airport at Eagle Pass. He grabbed his briefcase and stuck a foot experimentally out the open door, feeling around for the step. There wasn't any.

He slid the other foot out and jumped, hoping he wouldn't catch anything on the air frame. He did, and though his feet were now firmly on the ground, his coattail was hung up on the step he couldn't find before.

"I'll get it, sir," shouted the man who held the door. He reached over and unhooked the offending garment.

Nolan stepped away, case in hand, ducking his head carefully, as though the whirling rotor wasn't four feet higher than he was tall. The other man slammed the hatch and ran to catch up.

A little distance made conversation possible, though difficult, and they were now walking side by side.

"Car's over here, Mr. Nolan. I'm Fletcher Arnold. Welcome to Carrizo Springs."

They shook hands.

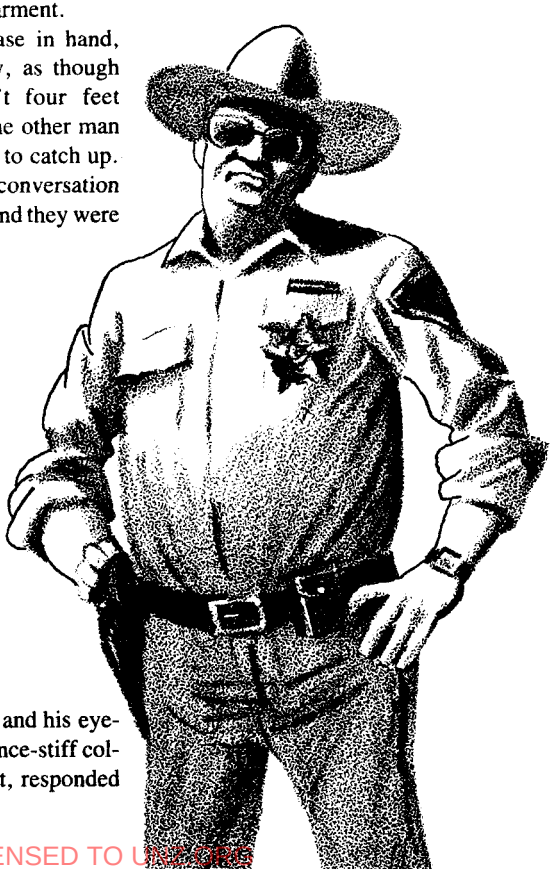
The car was dusty on the outside but wonderfully cool inside. Nolan climbed in gratefully and sat down, dumping his case on the back window sill. Fatigue had made a mess of him, both physically and emotionally, and a two-hour time difference hadn't helped. His mouth was dry and his eyeballs felt gritty, while the once-stiff collar, now sodden with sweat, responded immediately to the car's air conditioning and lay like an icy wet ring around his neck.

"How was the flight from Andrews, Mr. Nolan? Must be a real thrill to have the loan of Air Force One."

"Not as much as you might think. It's about the same as any other airplane; just a little more room. Flying always makes my feet swell. I'd take these shoes off it I was sure I could get them back on."

"I suppose you'll try to see the Alien right away, huh?"

"Those are my orders. What's it like?"



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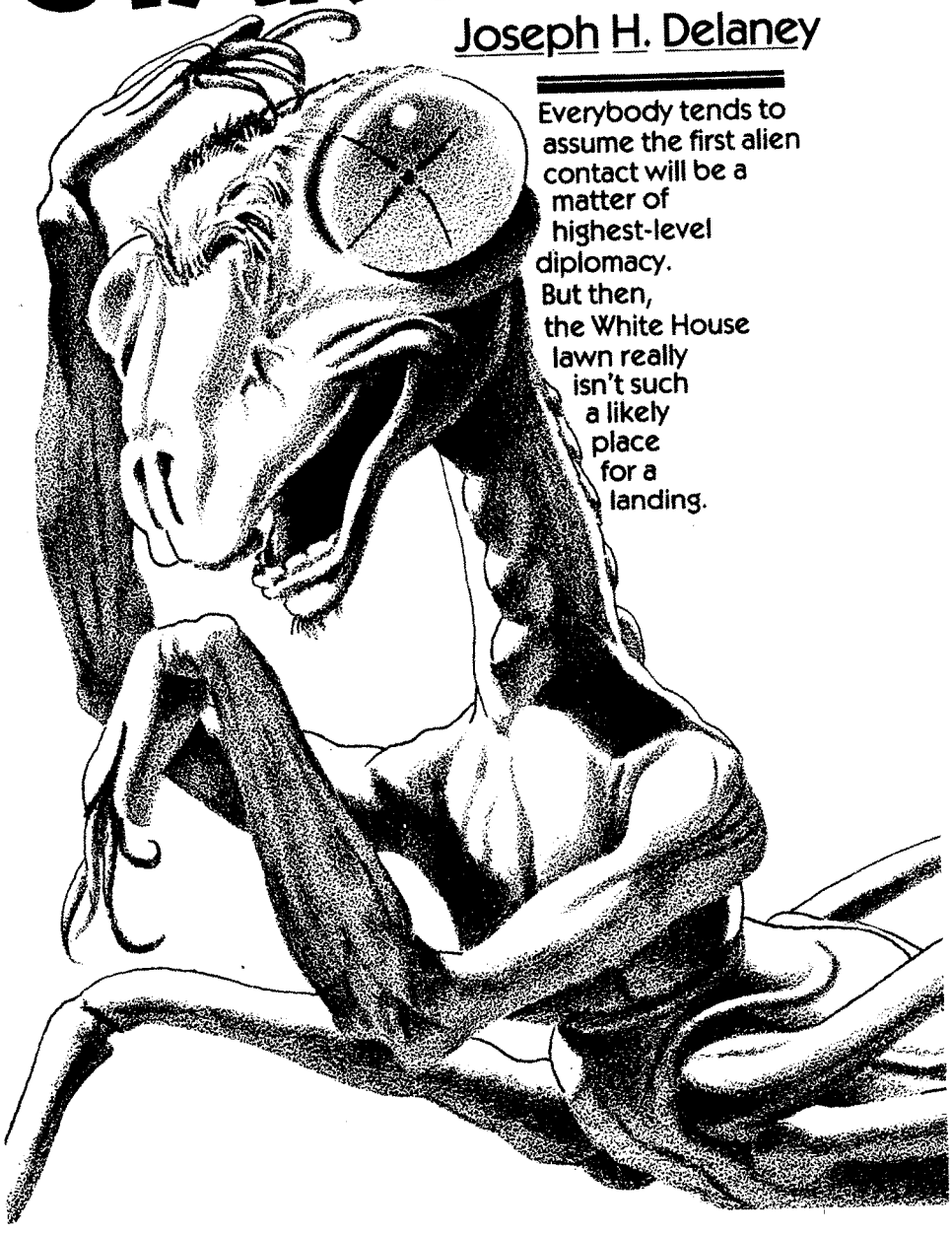
STAR-B-CUE

Joseph H. Delaney

Everybody tends to assume the first alien contact will be a matter of highest-level diplomacy. But then, the White House lawn really isn't such a likely place for a landing.



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"I wouldn't know. I haven't seen him. They've got him locked in a cell in the county jail and won't let anybody near him. Sheriff must have deputized every local for fifty miles around. Carrizo Springs is a sea of Winchesters."

"That bad, huh? What about the alien ship?"

"Same thing, only there's two or three acres of parked pick-up trucks around that. The Air Force sent a chopper over to take a look, and the pilot says they fired on him."

"What? Fired on a military aircraft? You let them get away with that? Did you arrest anybody?"

"Are you kidding? I'm one guy. I think you're going to be surprised at just how little authority the FBI really has in this situation, or the State Department either, for that matter. The locals are claiming this is strictly a non-federal situation, and so far we haven't been able to collect any convincing evidence to the contrary."

"A space ship comes down in the United States with an extraterrestrial life form aboard and that's not a federal matter?"

"Not according to Judge Miller, it isn't, and around here, his is the opinion that counts. Besides, we didn't see it come down. It was just there on the ground, all of a sudden; no warning at all. Nothing on radar, and no eye-witnesses to its descent. The locals claim it's not a space ship, by the way."

"What do they think it is?"

"There's no telling. This is wild country, Mr. Nolan, and the people are independent-minded and not just a little bit superstitious. If it had turned up anywhere else we'd have things under control by now, but this is Texas."

Nolan couldn't believe what he was hearing. He sat silently for a minute and looked out the windows. The car passed under a railroad viaduct, on top of which sat two western-looking types holding rifles. Behind them, horses munched contentedly on roadside grasses. Immediately ahead was the town: half a dozen asphalt streets crumbling at the edges and groups of dilapidated, unpainted buildings, many with the high-rising false fronts typical of western architectural ideas in vogue early in the century. "Where are we heading, Arnold?"

"County Courthouse—and Jail. It's all one combo. See the red brick building across the square, the one with the old 75 mm gun in front? That's it."

Arnold's driver wheeled the car around the block and stopped in the middle of the street behind a dusty county squad car. A man with a Winchester across his chest barred their way. On his head was an aged sweat-stained straw hat whose brim had frayed. But beneath it eyes examined them. After a moment the man's cheeks pursed, and he let go with a stream of tobacco juice that missed their bumper by scant millimeters. He didn't seem impressed with the U.S. license plates.

"You fellas want sumpin'?"

Nolan opened his door and got out. He fished in his pocket to find his case, then snapped it open so the man could see his I.D.

"Yewnited States Department of State! Now don't that beat all?"

"I've been sent by the president to

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look into this alien thing. Who's in charge here?''

''Reckon ah am.'' The Winchester shifted slightly.

''You the sheriff?''

''Naw. He ain't here. He's workin' the courtroom. Guess you'll just have to wait a while.''

I think not, Nolan said to himself. *That must be how Arnold lost control.* ''Which way to the courtroom?''

''Around the front. You can't miss it. If I was you, though, I'd wait here, and if I was fool enough to go in I shore wouldn't take that fella with me.''

Nolan nodded, turned, and started off, with Arnold trailing a step or two behind.

''Hey,'' yelled the man, ''git offa the grass. Use the sidewalk.'

Nolan stepped onto the cracked concrete slabs, noting all were slightly out of plumb. ''What's he talking about, Arnold?''

''I had a little disagreement with Judge Miller last night when I came to get the alien. I'm afraid I lost it.''

''Well then, maybe the man's right. Wait in the car for me, huh? I don't need any more hostility than there already is.'' He stood for a moment, until certain that Arnold would wait, then took the twenty or so steps to the door, climbed the stairs, and walked into the building.

The place was nearly empty. He walked by offices full of old books without managing to attract the attention of the county clerk, whose offices they were. In the center of the building was a rotunda containing the usual bulletin board, glass doors covered with fingerprint smudges, and the ever-present bronze plaque of names of the county's sons fallen in war. Nolan looked up at the sign on the far wall: 49th District Courtroom, Hon. John V. Miller. Below it, strong light poured through frosted glass panels in the double doors.

Nolan walked up and grasped a knob, pulling the door slightly ajar. Through the crack he could see a weathered oak bench rising high against the far wall, in the middle of which sat an old man in a black robe. He opened the door the rest of the way and stepped through, accompanied by a squeak from its ancient hinges.

There were half a dozen wooden benches on his side of the wooden rail which bisected the room. On the other side were two tables mounted directly in front of the bench. Two men were standing before one; at the other a seated man huddled over an open file.

In the corner, in a tan uniform much too tight for him, was a portly man with curly hair who eyed him suspiciously —the sheriff.

Nolan sat down in the front row and put his case across his knees before looking around him. From all outward appearances the judge had not noticed him and was concentrating on what the two standing men were saying.

Nolan found himself listening with interest. The young man in the torn T-shirt and blue jeans was pleading guilty to a minor theft charge; cantaloupes from some truck farmer's field. The judge gave him thirty days, with credit for time served, and ordered the sheriff to lock him up to serve the other twenty. The young man left, with the sheriff waddling along behind, very infor-

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mally, without bothering to restrain the prisoner.

There followed a brief, three-party discussion about some banal matter of personal interest; then the two attorneys walked past him and out the door. Still the judge did not seem to notice Nolan; he sat there for several minutes, writing. Nolan waited. He hoped the sheriff would return.

Abruptly the judge raised his head and said, "What can I do for you, young man?"

Nolan had sense enough to rise. "I'm Emmet Nolan, Your Honor. I'm with the U.S. State Department. The president sent me. Here are my credentials." He passed the leather case up to the judge.

"You're here about the creature?"

"Yes. My orders are to observe it; talk to it if I can."

"That's up to the sheriff, Mr. Nolan." He handed the case back. "It's his jail and his prisoner." The judge's entire attention was now on Nolan.

"Well, I came up here to see him, but he left. Surely you understand my problem. I realize there was a disagreement with the FBI agent who was here last night but . . ."

"It's not a question of us understanding your problem, Mr. Nolan. It's you who don't understand ours. We've got a court to run. That's what the people of this county elected us to do. That Mr. Arnold walked in here yesterday afternoon while I was in the middle of hearing a case and interrupted us. He said he was taking a prisoner we had locked up, and against whom a citizen of this county has filed serious criminal charges. Naturally, I had to say no."

"But this is a matter of national importance, Your Honor. It may be the most momentous event ever to have taken place in all of history. This creature could be an emissary of a powerful civilization. And we lock him in a cell?"

The judge looked down at him through thick bifocals. "I've heard all that before, Mr. Nolan. I've also been told that world opinion will be, and maybe by this time is, outraged by that very fact, but again, I tell you that it's not my place to interfere. I have to follow the law."

"But this transcends the law, Your Honor. It . . ."

"Nothing—*nothing*, transcends the law, young man. You want this creature? Well, all right; you bring me evidence that says I've got an alternative to doing what I'm doing. You bring me an order from a higher court that mandates delivery of this prisoner to federal authority; you bring me evidence that the United States has a superior right to his custody. Until you do, it stays where it is, to answer for crimes committed in the State of Texas against citizens of the State of Texas, because that's the only mandate I've got now."

He looked down at Nolan again. His voice softened. "You're not a lawyer, are you, son?"

Nolan shook his head.

"Okay, look, I'm not trying to make it hard for you, but you have to recognize that there's a difference between the way I personally feel and my official attitude on a case. Look around me; tell me what you see."

It seemed a strange request to Nolan, but the old man did sound reasonable,

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almost kindly. "A carafe, couple of chairs, some books, a sign with your name on it, a couple of flags . . ."

"There, you see; two flags. The Stars and Stripes on my right, the Lone Star on my left. Tell me, what's the difference between them?"

"Aside from the design, you mean? Nothing. Not that I can tell, anyway."

"Exactly. They both represent a sovereign power. And believe it or not, these powers are equal. That's why they're both here and that's also why neither rises above the other."

Nolan must have appeared puzzled at that remark, because the judge went on. "There are certain areas of the law where one or the other prevails. Texas yielded some of its sovereignty to the union when it joined. What it didn't yield it kept; and one of the things it kept was exclusive power to punish crimes committed within its own borders, as long as no federal statutes are violated. When that occurs, and it sometimes does, the law says that if the state catches the criminal first, we get to keep him until we're finished with him. Of course, there are also occasions when we'll yield to the federal power, provided we're officially asked, and provided it's done in proper form. That's been the trouble with this case, son; the federal people have been here trying to tell us what to do, but nobody's been polite enough to ask. You can understand that, can't you, Mr. Nolan?"

"Yes, sir, I can."

"Good. Now, please understand something else: I'm the judge. Someday I'll have to hear this case and make decisions about it. Those decisions have to be fair and impartial, and I can't be fair and impartial if I hear evidence or gain knowledge outside the official proceedings. That means I can't discuss the matter any more, with you, or with anybody else except in open court, on the record. Do you understand that?"

"Yes, sir, but . . ."

"I know what you're going to say; you've got your orders, too, and I can understand and sympathize with that. And the next thing you'll do if I can't talk you out of it is go down and mix it up with Sheriff Button. Well, I advise against that. Billy's got a tendency toward self-importance. You might say he's got a chip on his shoulder over this, because he's mighty jealous of his authority. So, if I was you I'd walk across the square and talk to Wally Woods instead."

"Who's Wally Woods?"

"He's another sour old goat, like me. Pretty good lawsmith, though; been at it a long, long time. I appointed him to represent the creature."

Nolan thanked the judge for the advice and left. He found Arnold sitting in the car trying not to look at the tobacco-spitting deputy, who glared at him unblinkingly.

"Drive us around the square and park," said Nolan, jumping in the back seat.

The driver whipped it around and settled in next to an alley full of trash and stray cats.

"What are we doing now?" Arnold asked.

"Looking for a lawyer named Wally Woods."

"Upstairs, Mr. Nolan. I see a window—Woods and Woods, Lawyers."

The two of them piled out of the car

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and stumbled up the rickety stairs. There was an unmarked door at the top. It was closed. Nolan pushed it open, not knowing what was customary here, though Arnold had reached up to knock.

"Come on back," a gravelly voice yelled. "I've been expecting you."

They followed the voice back through the darkness and into a dimly lit but modernly furnished office. Two walls were lined from floor to ceiling with books. In front of the window sat a man, old, bald, apparently toothless, dressed in a white shirt without tie and wearing broad plaid suspenders. The desk in front of him was as ancient as he, with much elaborate carving.

"Judge Miller called me and said you'd be over. Which one of you is from the Department of State?"

"I am. I'm Emmet Nolan. This is Fletcher Arnold."

"FBI, right? Heard about you, Mr. Arnold."

Arnold's face flushed.

"Coffee's on the stove if you want some, or there's beer."

"Not just now, thanks," said Nolan. "Maybe later. The judge said you represent the alien."

"Well, that's what I've been appointed to do. Don't know how it's going to work out. I haven't figured out a way to talk to it yet. Don't even know if it can talk."

"Just exactly what was it the alien did, anyhow?"

"Well, it did a whole bunch of things. Let's start with the easy ones. First of all, there's trespassing. It plunked some kind of house or ship, we don't know which, smack in the middle of Ralph Eppler's best field of milo. Ralph didn't like that at all. Then it set fire to the field. That's malicious destruction of property. The field fire burned up one of Ralph's barns, including most of his winter feed and three or four tractors. To save his house and the rest of the outbuildings, Ralph started cutting a fire brake with a bulldozer. He stopped the fire, then turned on the alien, just going closer for a look. Ralph don't know exactly what happened, but all of a sudden a big tongue of flame shoots out of the 'ship,' chews right through his engine block, and blows the tractor to pieces. Ralph's riddled with cast-iron fragments, but fortunately he lived, so the charge is only attempted murder."

"There's just one alien."

"That's all we found. I was inside the ship thing. It's not very big, and there's really no place for another one to hide."

Nolan was amazed that Woods had been allowed to do all this, but then, it'd be natural for these people to treat one of their own a little differently than they would a stranger.

"Anyhow," Woods continued, "Ralph's wife got on the phone as soon as she saw what was happening, and called Belly Button—that's what we call the sheriff around here. Don't you try it, though. He'll eat your lunch.

"When he got there, the alien was wandering around, big as you please, just like nothing had happened. He didn't pay any attention to Ralph, or to them either, until they slapped handcuffs on him. Then there was some real rassalin' round, to hear Belly Button tell it. They couldn't get it in the car until they hog-tied it."

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"I see," said Nolan. "What happened after that?"

"Well, the sheriff took it into town and put it in a cell. Booked it from there, too. Took pictures through the bars. Want to see some of them?"

"You bet I do. Do you have them?"

"Sure. The D.A. knows he has to give them to me anyhow. Sheriff had them ready as soon as he knew I was going to be appointed. Here you are." He handed Nolan an envelope.

They were bad pictures, obviously taken in less-than-adequate light, and by hands that obviously weren't very steady. Nolan had a little trouble making out the form.

"Looks four-legged."

"It is. Four walking legs. Six if you count the arms. It's sort of like a mantis; you know, the praying bug."

"There's nothing at the end of the arms. They just stop."

"The critter's got little tentacles, but there's some kind of cover they slide back into. The feet're the same but not as long."

"Very interesting. How big is it?"

"Your size, maybe, 'course it don't stand up straight, like a man does."

"It doesn't seem to wear clothes. At least, the picture doesn't show any."

"No. We didn't find anything on it, either."

"We? You were there?"'

"When they brought it in? Sure. Whole town was there. This is a small community, Mr. Nolan. What one knows we all know. News travels fast."

"I know. That's the reason I'm here, Mr. Woods. This thing is pretty close to causing an international crisis, and I'm afraid that the powers that be in Dimmit County may be acting against our country's interest."

"Hows that, Mr. Nolan?"

"I mean, rumors of the alien's arrival are getting out, everywhere. The United States has an alien space vehicle under its control, figuratively. It has the pilot imprisoned."

"So?"

"Other countries will be seriously concerned that this might give us a military edge they can't match. You know how the Russians feel about that sort of thing. And the Chinese will be peeved too. So the president is very much afraid that if we don't do something to allay their concerns, the result might be war."

"Why?"

"Because nobody, myself included, can conceive of a being with the technology this one possesses who doesn't have the weaponry to match. And it just may be that one or the other of our enemies, or maybe both, will decide that now is the time to strike—before we succeed in adding that weaponry to our own arsenal."

Woods looked grave. "I guess we never considered that angle."

"Others have, Mr. Woods. So far, we've managed to get by by calling the reports of the landing *rumors* and by saying we're investigating, but they know there's more to this than rumor. We won't be able to keep it up for very much longer. Two days is a long time in international politics. We'll have to do something pretty quickly."

"You're talking to the wrong person, then. I'm just a country lawyer. I've spent a lifetime learning to do things according to the rules, and I know the

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rules work. I don't break them. This is a defendant like any other."

"All right. What do the rules say about a human being in a spot like this? What about bail?"

"There hasn't been any bail set."

"Why not?"

"Because, first of all, nobody is sure how the creature got here, and what capability he might have to abscond. And we don't know what harm it's capable of doing physically. For all we know, there might be weapons of some sort concealed on its body right now, though I'll admit it hasn't made any effort to use them if it has any.

"That's one of the reasons no bond has been set yet. There are others; for instance, we don't have any way of making the creature understand the nature of the bond; we don't know if it has anything to put up . . ."

"Don't worry about that part of it; the United States Government will be his surety."

"Okay. So money's no problem. Can the Government guarantee its appearance in court here in this county?"

"Of course."

"How?"

"We'll bring him."

"By force."

"If necessary."

"Where does he stay in the meantime?"

"Wherever we decide to put him."

"I see; then the federal authorities intend to prosecute him?"

"Of course not; at least, I don't know of any present plans to do anything like that. What would they charge him with?"

"Does it matter? How about violation of the immigration laws?"

"Technically, I suppose he did do that, but . . ."

"Let me tell you what I'm getting at, son; what I'm suggesting is that, unless the U.S. Government is prepared to charge this creature with an offense against the United States, there's no legal way you can restrain him.

"If we get bail set, and if you bail him out, he's free. The only restraint you can constitutionally impose is if you reasonably believe he's about to jump bail. Then you can seize him, but the law requires you to immediately return him to the custody of Sheriff Button."

"Catch-22?"

"Catch-22. As long as you concede that this creature is a person, he's clothed with the same constitutional rights as you and I. And that includes the right not to be restrained in his liberty without due process of law."

"Suppose we bailed him out and then charged him?"

"Judge Miller wouldn't like that. The first thing he'd do is order the defendant to appear in his court."

"And if the creature didn't do it?"

"He'd forfeit the bail, issue a bench warrant, and the defendant would be arrested."

"From federal custody?"

"That might take a while, but if he had to, the D.A. would get him back, probably through the process of the federal court system."

"They'd do that?"

"You better believe it. The federal courts take the constitution seriously. And the law gives them no choice."

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"Okay, that's out. What else is there?"

"You tell me. So far we've only talked about procedural things and my own observations. That's permitted, but the time may come when I can't be of any help to you, even if I want to be and even if I personally believe it's in the best interest of my client to cooperate. There's such a thing as attorney-client privilege, and that's something I believe in."

"Well, okay. I see what you mean. You've been very helpful, Mr. Woods, and thank you." Nolan started to rise.

"What are you planning to do next?"

"Why, see the sheriff, I guess. Make arrangements to interview the alien and look at his ship."

"I'll go with you. Can't get anything else done with this ruckus going on anyhow, and you'll have less trouble with me along."

"Fine," said Nolan. This was better than he'd hoped.

"You got a car?"

"Yes."

"Air conditioned?"

"Yes, of course."

"Good. We'll go in that. My air conditioner's broke." He got up out of his chair, strained to straighten his back, and walked around his desk to a door set in the far wall. "Let me get my stuff." He opened the door, took a straw hat from a hook, and put it on. From another hook he took a gunbelt, buckled it on, gave the ancient long-barreled revolver it contained a hitch, and said, "Let's go."

"What's that for?" Nolan asked.

"Law requires it. I'm part of the posse. Whole town is. Every able-bodied male between 16 and 60 has to respond to the hue and cry. 'Course," he winked, "I'm 66—technically exempt, but why not. Makes me feel young again."

The Eppler place was about a mile and a half out of town, on the north edge. The first deputy they came to had a walkie-talkie, and passed the word back to the rest as soon as he saw Woods in the car. They drove up the caliche road at a brisk pace, trailing dust.

"Doesn't it ever rain here?" Arnold asked.

"Not much, and never this time of the year. Farmers around here irrigate, otherwise nothing would grow. There's a lot of artesian water in the area."

The driver turned the car into a long driveway which led from the larger road. On the right was a blackened area where the crop had burned, and the foundation remains of a big building. Opposite the blackened area was an object that looked like a big, faceted diamond.

"There," said Woods, "is the ship."

"It's tiny," said Nolan. "Looks like a plate-glass igloo."

They parked the car in line with half a dozen other vehicles and got out. Nolan decided that the stories about acres of pick-up trucks on the site were exaggerated; still, there were at least fifty armed men in the immediate area. Woods spoke to the nearest, then motioned the others to follow.

Up close, Nolan could see a visible opening, where two of the blocky facets had retracted. It permitted a view of the interior without need of entry.

"Pretty empty, isn't it," said Woods. "We have no idea how it's controlled;

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it seems to be little more than an enclosure. Kinda disappointing, huh?"

"Yes, very. What's that thing on the wall?"

"We examined that before," said Woods. "It seems to be some kind of sink. Watch." He stepped in, put his hand inside it. Immediately, water bubbled up from the bottom until the basin was half full.

"Peculiar design for a sink, I'd say," said Arnold. "Do you know what this stuff is?" He pointed to another bin, inset on the wall. "It looks like chunks of fudge."

"We took some of it down to Britt Barr's place. Britt's our local vet. He's got the closest thing to a chemical lab in these parts. So far, the only thing he's been able to tell us is that it's some kind of vegetable protein. He thinks maybe that's what the alien eats."

"Did they try it out on him?"

"Oh, sure. Belly Button's got a bowlful in the cell. Last time I was there, though, the bowl was still full. It hadn't eaten any."

Nolan made a circuit of the craft, studying its blank surfaces. There was absolutely no sign of anything remotely resembling a control mechanism. There wasn't even any control on the door.

"What about the weapon, Mr. Woods? You know, the flame you mentioned."

"Outside's as plain as the inside, far as we can tell. The boys checked it over good and didn't find a trace of a muzzle. Maybe it retracts, though it's hard to see where. The walls of this thing aren't that thick. 'Course, it does seem to have some strange habits. Let me show you something."

He stepped outside, reached down, and picked up a good-sized clod, which he dropped on the floor of the craft. "Watch this."

At first, the clod merely lay there. Presently, however, it appeared to grow smaller.

"It's sinking through the floor," said Woods. "Pretty soon it'll be all gone, presumably outside and under this thing."

Arnold looked apprehensively at his feet. "Seems solid enough. As long as it treats people all right . . ."

"As far as I know, it hasn't made a hostile move since it blasted Ralph's tractor. We've been careful not to bring cars too close, though."

"How about we get some pictures, Arnold?"

Arnold went back to the car, got his camera, and returned. He shot several discs of the inside and was finishing up on the outside when the sheriff drove up.

The first impression Nolan got was that the man should be on a T.V. beer commercial. He certainly had the stomach for it. He got out of the car carrying a sack and came straight to the vehicle.

Woods turned to greet him. "Sheriff."

"Wally. You takin' care of the feds now?"

"Just showing them around a little. What's the sack for?"

"Figured I'd get the critter some more food. He ate what was in the bowl."

Nolan cleared his throat; a cue Woods immediately took. He introduced them all to the sheriff.

"We'd like to talk to the alien, Sheriff," Nolan said.

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Button looked him in the eye. "You would, huh. Well, lotsa luck. We've been trying. So far, all he's done is burp, and he didn't do that until after he ate."

"No sounds at all?"

"Nope. He don't pay any attention when we try to talk to him, either. It's like he don't hear."

"Maybe he doesn't. There's no physical reason why communication has to be by means of sound, although I personally can't imagine any substitute that would be as efficient."

Sheriff Button stepped inside and began throwing great handsful of the alien food into the bag. A piece fell on the floor, and, amazingly, did not sink. Button noticed it when he was finished filling the bag. He reached down with a grunt, picked it up, and returned it to the bin.

Evidently, thought Nolan, the ship discriminates between dirt and useful things. When the time was right, he was betting, government scientists would be able to find the controls, too. In the meantime, he concluded Button wasn't quite as hard to get along with as everybody thought, and he meant to cultivate a friendship with the man.

"Sheriff," he said, "would it be all right if we gave it a try? Communicating with the alien, I mean."

"I guess so, long as Wally's there, too, and as long as he agrees to it. It's his client."

"I'll agree," said Woods. "Maybe you fellows can suggest an expert to help me out. It's hard to prepare a defense when your client can't communicate."

"Remember, Wally: my prisoner, my jail. Keep it under control, huh. I already got enough trouble with news people trying to get in. I had to seal off the town."

They're here, thought Nolan. *Time to do something.* "Well," he said, "why don't we get started now?"

When they arrived at the jail, doors opened magically. Wally Woods was, of course, the key to that. The alien already had a visitor, whom Woods introduced as Britt Barr, the vet.

There was a horrible odor about the creature.

"He's not very sanitary, Wally. Worse'n a horse. We have to keep a mop and a shovel handy. Right now he seems to be resting."

Nolan got his first look at the creature through the bars, and instantly decided he'd need photos of his own. The alien was, as Woods had described it, mantis-like, but its body wasn't armored; it was soft and clearly endoskeletal. It sat, hunkered down, in one corner of the cell, and was using its tentacled fore-appendages to groom the soft grey fur that covered its head.

Nolan decided right away that there was something odd about its head, something that didn't quite fit his preconception of the creature's appearance.

The head was sleek, and the muzzle fairly long. It had great, dark eyes set one on each side of its head, but no visible ears. The eyes, it turned out, moved independently of one another, and from their location, Nolan concluded it was impossible for it to have binocular vision.

The alien finished its grooming, re-

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tracted its tentacles, and sat there looking at him.

Nolan raised his hand and watched the creature's eyes. The eyes followed its movement. Next he took a pad from his pocket, drew several figures: a sphere, a circle, and a triangle. He held this up to the alien.

The alien moved. It scudded closer to the bars and cocked its head, one eye close to the paper. Nolan could see slits of nostrils above its upper lip and, as it strained, the tips of flat, white teeth showing between.

"Maybe it's too dark in here," he said to Woods. "It seems to be interested in the symbols, but it can't see them."

"I'll send for more lights," Woods replied.

But it wasn't necessary. A deputy, who'd been watching, disappeared briefly and came back with a rack of floodlights.

"That's better," said Nolan. The room was now as bright as day. "Do you think you might be able to scare up a black-board and some chalk?"

"Ought to be some in the courtroom," the man replied. "I'll see."

While he waited, Nolan took the pad and sketched a rough drawing of the alien. When he was finished he held it up to the bars. Again the alien strained to look at it, first with one eye and then the other.

Nolan drew it back and turned the page, then thrust both the pad and the pen between the bars, shaking them in the alien's face. The alien raised both arms in front of him, and little tentacles snaked out to seize the objects. It held them each in turn up to its eyes and studied them.

Then Nolan's hopes were dashed. He thought the alien would take the pen and draw on the pad. It didn't. When it was finished with its examination it held the pen and pad up to its nose, sniffed each briefly, and then dropped both on the floor.

"Same thing it did when I tried it," a voice said.

Nolan turned to see Sheriff Button standing behind him.

"It seems to see very poorly. That may be the problem. Perhaps it needs glasses or something."

"We didn't find any on it, Mr. Nolan, and you've been to its ship."

"Here comes the blackboard. Maybe that will help."

He sat the blackboard up in front of the cell and sat about repeating his previous exercise. The alien watched, apparently with great enthusiasm, and Nolan made his lines extra broad and white, in the hope that this would help.

Once he had given the alien the opportunity to peruse his own drawings, he pushed the blackboard up to the bars and handed the chalk through. Tentacles flashed out and took it, raising it to eye level. Then the alien held the chalk in front of its nostrils, sniffed it carefully. Then its mouth opened. It popped in the chalk, chewed it up, and leisurely swallowed. Then it emitted a loud and foul-smelling burp.

"See," said Button. "No cooperation at all. What are you gonna try next?"

Nolan looked back at him, but said nothing. Once again he sent Arnold out to get the camera.

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"Could I use the phone at your office, Mr. Woods? I need to make a call."

"Of course. We can go now, if you like. You know, I'm beginning to feel pretty pessimistic about this case."

A few minutes later the two of them were back at Woods's office, gulping cold beer and enjoying the air conditioning.

"Gets pretty hot here, Mr. Woods."

"Yep. Used to be, we'd sort of close everything down in the summer time. Back in the old days court let out on June 1st and didn't start again until September. I used to use the time to travel, but modern science changed all that. 'Course, now I'm getting too old."

"I guess you'll be retiring one of these days."

"To what? What else is there to do? Anyhow, I like to think that us old-timers are needed to keep an eye on things: keep changes from getting too radical, not that there hasn't been enough damage done already."

Nolan finished his beer and began fumbling around in his case. "I guess you've seen quite a few already, Mr. Woods." Actually, he was only making conversation, but Woods took him seriously.

"Yes, I have. And I must say I liked it better in the old days, when people knew what was what. And I guess maybe that's why I stayed out here instead of going to a big town. Here, law's kept the personal touch it needs with the people, instead of becoming a commodity like it has elsewhere. I was in Houston a couple of months back. You know, they've even got lawyers advertising on T.V. there. Me, I don't even have a listing in the Yellow Pages. But out there you've got them quoting prices in great big ads, like they were selling hamburger. You get one price on one page and one just a little lower on the next, until by the time you get to the end you've got the last guy working for nothing. Beats me how they can do that and still stay honest, and it's my guess a lot of them aren't. They have to make it up some way.

"Give you another example: An old friend of mine's a judge out there. He says he hates to make an appointment any more, because he hasn't got anybody on his list who's qualified; nothing but kids. And the defendants; they've all got it in their heads that law's the equivalent to magic. Long as the county's paying for their defense, they tell these kids how to run their cases, and the dang fools let them. The old-timers won't take that. They size up the chances and tell the client the truth, which is the last thing they want to hear. Then they squawk to the court that the lawyer won't follow instructions, the old-timers pull out of the system, and the courts are stuck wet-nursing the kids. What's that thing?"

"Scrambler, Mr. Woods." Nolan released the catch and pulled the cord from the telephone handset. He plugged it into a little black box and ran another line into the receiver. "These days you can never tell who's listening in, now that so much goes by microwave and satellite. You ought to see the forest of antennas on the Russian Embassy's roof. This'll mix it up a little." He finished and started to dial.

Woods got up to leave, but Nolan waved him back. He didn't think the

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circumstances warranted running the old man out of his own office.

As a result, though Woods tried not to be obvious about it, he heard half of the conversation. Nolan was talking directly to the Secretary of State at first, and later the talk became three-way, with someone, Woods thought perhaps the president, also on the line. From time to time Nolan's face took on a troubled look.

When it was over, Nolan turned to Woods and said, "I don't want to bust anybody's balloon, but things are getting kind of touchy over there. The federal government may have to intervene after all."

"What does that mean?" The old man sounded defensive.

"What it means is that, despite what Judge Miller told me, there may be a basis for federal jurisdiction in this case. According to the secretary, there were a bunch of emergency statutes enacted by Congress just before World War II that related to national defense. You probably know the ones I'm talking about. Well, somehow, most of them never got repealed."

"That sounds typical. And yes, I remember a few of them, though I was a child at the time. They're planning to back-door Judge Miller?"

"They apparently think the situation will become desperate enough to try that. The president says the Russians are really getting ugly about this whole episode, and our own news people are worse. So far they've officially denied the stories about an alien invasion, but evidently some of the townspeople have talked to friends and relatives out of town. The word's out that something happened here."

"What are they planning to do? Do you know?"

"I know some of it. Not much. First of all, if they can, they mean to leave everything in local control. The president's been in touch with the governor, and the governor's been in touch with the sheriff. Outside of closing off the roads, they'd rather not have too much conspicuous help, and the state police can manage that by themselves. But if they bring in the military like a couple of congressmen are hollering for them to do, it'll be a clear signal to foreign powers that we're lying. The president's afraid they'll do something stupid, like lay a missile on this town."

"Why?"

"To keep us from gaining a military advantage. Then, of course, they'd say they were only trying to protect humanity."

"Starting a war would protect humanity?"

"It wouldn't start a war. At least, that's the way the president has it figured; not if it was just one missile. He wouldn't dare order a full retaliatory response to that. But the results would be rough on Carrizo Springs."

"What is he going to do?"

"For the time being, just about what we have been doing. There'll be an official press conference two hours from now, to explain that there is a strange new structure here—they're not going to call it a ship—and that scientific teams are studying it. He'll also explain that there are plans to include foreign scientists in the later studies, once it's been determined that the thing isn't dan-

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gerous. That's the carrot, intended to give Moscow and Peking some hope that they'll be allowed in on it. There's a stick, too. The military's being put on red alert everywhere; ostensibly to meet the threat of further alien landings, but the message won't be lost on the Russians. They'll understand."

"I guess I do too, Mr. Nolan. A little while ago I was complaining about my own profession going to the dogs over trivia. But it's not just us, is it? It's the whole world. Everybody's afraid somebody else is going to get a little bit more and they're going to get a little less. Nobody seems to care that it might cost everything we've already got. I've . . ."

The phone rang, and Woods picked up the receiver. It was Sheriff Button. Woods listened for a few moments, grunted a couple of times, and then said, "I'll be right down." He hung up.

"Troubles, Mr. Woods?"

"Troubles, Mr. Nolan. Belly Button says the alien's gotten sick; throwing up all over his jail. Britt's down there doing what he can. I guess I'll go down too; you coming?"

Nolan left his case in Woods's office and followed the old man out the door.

At the jail the deputy on duty passed them both immediately, with hardly a word to Woods. Nolan found Arnold already there, talking to the sheriff. Evidently the talk with the governor had mended the rift between the two authorities.

How they stood the overpowering stench Nolan could later not imagine. It permeated the entire building. The alien's cell was now open, and the being had collapsed on the floor. The vet was doing his best, checking those things which, in a human being or Earthly animal, would indicate the state of health.

Nolan wondered when the government teams would arrive. They'd naturally have medical people who might be able to help. Then he realized how foolish this sort of thinking was. There was probably nobody among them as qualified as Dr. Barr. Veterinary medicine required training and experience with many forms of life; experience no M.D. could ever hope to match.

The creature let out a mighty belch, from which Barr recoiled.

"Gawd, that's awful," he said.

Nevertheless, as soon as the air cleared a little he went back to work. For the benefit of spectators he began a commentary. "The alien has several hearts, or heartlike organs. They all sound like they're pumping strong. I hear a loud rumbling in the abdomen, probably representing a large accumulation of intestinal gas. It has a tremor, which at times is violent, and its equilibrium seems severely disturbed. Sheriff!"

"Yeah, Doc?"

"I think it might be a good idea to get it out of here. I don't think there's any danger of escape, sick as it is. I'd recommend we get it out in the open — and the sooner the better. I'm not sure how long my own stomach is going to hold out."

"We can get the tables out of the courtroom and set 'em on the lawn, Doc. Maybe the boys can put a tent up around it; somethin' with a little ventilation."

In reply there was a loud, rude sound. Barr rushed out of the cell and headed

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for the outside door. Others soon followed.

"I thought you said you searched that critter for weapons, Sheriff," the vet said.

Belly Button didn't answer, except for a disdainful look. Pretty soon two battered oak tables, the counsel tables from the courtroom, were standing in the middle of the lawn. Deputies brought cotton duck tarpaulins and covered them, and then a stretcher, bearing the alien, emerged from the jail door. Nolan and Woods retched as the alien cut loose with another blast.

"Let's get upwind before he does it again," said Woods.

Nolan followed him around the tables to where Barr stood, looking bedraggled.

"Bet you're glad you don't get many patients like him, Doc."

"You can say that again, Wally. I don't mind telling you my professional curiosity about that critter's dang near satisfied. I don't think there's much I'm going to be able to do for it."

"Why don't you do what you always do—shoot it full of penicillin and then tender your bill."

"Wally, you're always complaining nobody understands your work, but you know, you're just as opinionated as everybody else. How would you like it if I gave you professional advice?"

"People do it all the time. But—sorry, Britt. I didn't know it was going to upset you."

"That's not it, Wally. I guess I'm just plain uncomfortable, with the smell and all, and the frustration of not being able to work this out. But you know, I've got the oddest feeling I've been there before."

"What's that supposed to mean?"

"I'm not sure, really. By the way, I know what made him sick. That's not the problem. It's that stick of chalk he gobbled up a couple of hours ago. The real question is, what to do about it. It's like when a cow gets a belly full of green clover, only I don't know enough about the alien's anatomy to do what I'd do for a cow. Hey—what's that?"

A noise wafted in on the breeze, a slapping noise.

"Offhand, Doc, I'd say help's on the way. Here comes your bureaucrats, Nolan."

It was indeed. Three helicopters landed in the truck lot behind the grain elevator. From them marched a variety of people, some in uniforms with impressive braid and fancy hats, some in business suits, and a few, including some laid-back individuals with videotape equipment, who wore short pants and T-shirts.

Belly Button took command. He wasn't about to let anybody stomp in there and muscle in on his turf. He told the scientific people to come on up, but kept the others back. "You boys'll be fine right over there," he said to a bevy of pompous-looking generals, pointing to the downwind side of the table.

Nolan's eyes searched the crowd of newcomers for familiar faces. He found only one, and the sight made his blood boil. "Arnold? Where are you?"

Arnold had been back in the crowd of local spectators, talking to a couple of girls. He hurried over.

"Look who's here, Arnold." He pointed to a short man with a goatee.

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"Mr. KGB himself, Kalykin. Bust him."

"Right." Arnold rushed over. In seconds he was frog-marching the protesting Russian in the direction of the jail. "I think there's a recently vacated cell in there that'll do just fine. Be right back."

That was the end of the action for a while. Nolan found himself out of it and standing pretty much by himself. The vet had gone back to his patient, and Woods had wandered off into the crowd somewhere. He couldn't see the alien any more for all the bodies, except when, on occasion, the creature expelled a little more gas. The military had fled at the first attack, and later piled into cars to go look at the alien ship.

Suddenly, Arnold was back, looking dejected. "I had to let him go," he said, pointing toward the tables. "He had a pass, signed by the president. I kept him in the cell as long as I could, though. What's been happening out here?"

"Can't tell much. But you know, I've been thinking about what Doc Barr said a while ago. Wouldn't it be funny if . . ."

Suddenly a squeal of tires and angry shouting came from the street. Nolan recognized the man running toward him, yelling for the sheriff. It was their tobacco-chewing friend.

Behind him there were others, among them some of the military people. Nolan spotted Sheriff Button in the crowd and took off toward him.

"It's gone," the man told Button. "Just winked outta sight while we was watchin'. Ain't nothin' left but a hole in the ground, and that stink's somethin' awful."

Belly Button lost no time in sizing up the situation, and Nolan had to admire his quick thinking.

"Round up the posse," he told the man. "Spot some riflemen around the square; I want them on all the roofs. Get this crowd dispersed too, and tell the boys at the fire house to warm up the pumper. I don't want the town burning down if that thing comes here."

The man ran off to relay the sheriff's orders.

The locals knew what to do. What's more, they trusted the sheriff's judgment, and they knew better than to disobey.

He had more trouble with his visitors, most of whom were appalled at the idea of taking his orders. He had the firepower, though, so eventually they were all herded back toward the courthouse, except for Doc Barr and a couple of the M.D.s who were helping.

Nolan and Arnold, of course, were left alone and continued to watch pretty much unhindered. But after ten or fifteen minutes the shock began to wear off people, and they started to get restless again. Nolan himself started to feel ill at ease. Something, he felt, was about to happen.

The feeling grew as seconds passed. It became physical, like sitting in a dentist chair watching the drill descend. The air felt charged, and in a moment he realized that it was. His hair rose and stood on end, and there was a curious sound in the now-silent square, like someone ripping a seam from cloth.

The vehicles appeared abruptly—not from space, but from thin air. Their outlines were first visible as atmospheric distortions, somewhat like those

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seen near superhot pavement in summer days. But unlike mirages, they grew more distinct, losing their transparency and taking solid form.

Nolan wondered briefly if he was in line of the riflemen's fire. He almost turned and bolted, but curiosity overwhelmed him. Now, before his eyes, not one but two alien artifacts stood, one behind the other. One looked familiar. It was the same, or an identical, structure, as had been in Eppler's milo field. The other was about the same size, but differently shaped.

The sheriff stood the nearest, his hand on his gun butt. "Keep 'em in the holsters, boys. Nobody draws unless I draw first or they shoot." Then he too waited silently.

Out on the street there was a grinding sound. The pumper truck rolled up and its crew began dropping hose. There seemed to be no danger, though. The short, well-watered grass of the courthouse lawn was not tinder-dry like the milo. It was getting scorched, but it didn't burn.

Then there was movement at the alien machine. An opening appeared on its side, silently. Nolan saw Arnold's hand creep inside his coat and stop there, resting on his own weapon. He himself was unarmed and wished he wasn't.

Long moments passed before anything else happened, and when it did it was curiously ordinary. A head popped into the doorway, topped by a floppy, wide-brimmed hat. The head differed markedly from that of the first alien, though the rest of the body was fairly similar, aside from the clothing.

The first head was joined by a second; then, abruptly, the first stepped out and calmly gazed around. The second followed. Each was roughly a quarter the size of their captive, but unlike it, they had fully extended manipulating appendages. One of them held a coil of rope-like material, waving it around in the air.

Nolan kept his eye on the sheriff, knowing that if trouble started it would begin with him. But Belly Button's hand had risen off the gun butt and was now propped on his ample hip.

The two beings took some experimental steps away from their vehicle, moving slowly and deliberately on their four walking legs. Nolan noticed they wore coverings, even on their feet. The rear pairs had strange projections.

Together, they moved slowly toward the table where the first alien still lay, eyes rolling. It greeted them with a tremendous belch. With that their pace became faster, and as they approached, one of them reached under his clothing and pulled out an instrument, which he applied to the abdomen of his stricken comrade.

There was a hiss, and the being returned the instrument to its place. The creature's eyes stopped rolling and it seemed to grow calmer. The other being dropped a noose from his rope and worked it around the creature's neck, tugging gently. The creature struggled to rise, clambering to its feet unsteadily, and stared down at the ground.

With some coaxing from the smaller ones, it jumped off, and they rewarded its efforts by stroking and patting its neck. Then they began leading it away.

"No—stop them," yelled a voice. It was Kalykin. He ran forward into the

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arms of one of Button's regular deputies.

"Get out of my way, you stupid cowboy." He kicked the deputy in the groin and charged the aliens. Other deputies rushed to restrain him.

"Do something," the Russian protested. "They are getting away."

And they were. They had the big creature at the rear of the vehicle, and the door open. The one with the rope led it inside.

By this time the military was also getting into the act. A burly general with three stars on his shoulder and a chestful of fruit salad sided with the Russian. "I don't like him either, Sheriff, but he happens to be right, this time. So I'm ordering you to arrest these creatures. Your country's safety is at stake."

"Well, I ain't gonna' do it, General, and I might add you ain't the boss; I am. Them're my men up there on the rooftops, not yours. Course, I'm gonna ask those people to visit a spell, and I think they'll be neighborly enough to oblige me. Hey, LeRoy?"

The tobacco-chewing deputy strode over. "You want me, Sheriff?"

"Yeah, LeRoy. Take that Russian inside and lock him up in the cell we had the sick cow in."

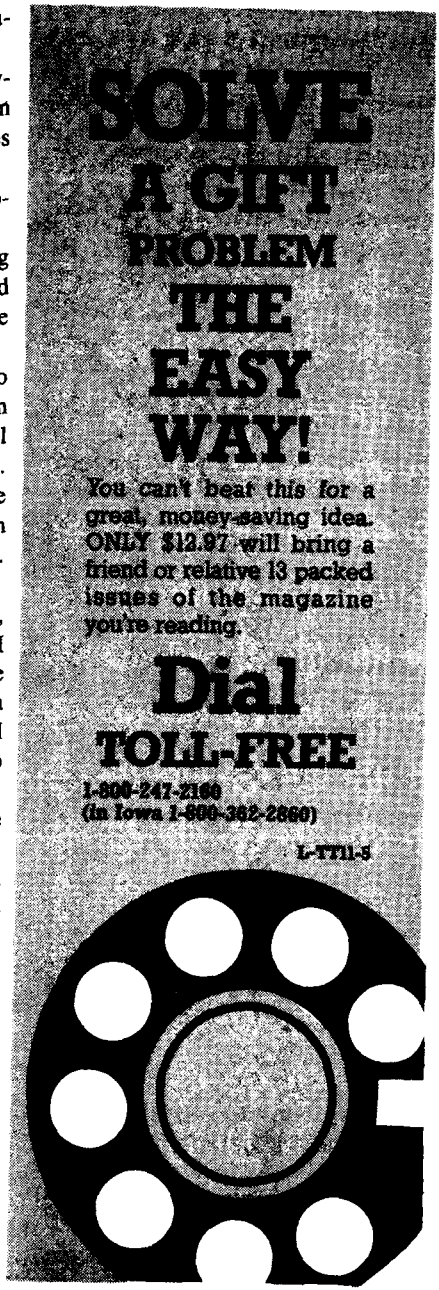
"Yes sir, Sheriff."

"And LeRoy, you might want to close all the windows and turn off the air conditioning, too. Drafts ain't healthy."

LeRoy took Kalykin by the collar, gave him a knee in the rump, and marched him off.

The general stared in disbelief. "What did you say?"

"I told him to put the Russian in the



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sick cow's cell. Now, excuse me, I gotta organize a bar-b-que."

Hooves thundered down Carrizo Springs' main street, and the roaring crowd was on its feet, cheering the winner, who turned out to be a neighbor.

"Didn't beat him by much, though, Wally."

"The alien's a good little rider, John," the old lawyer replied.

The significance of that wasn't lost on Fletcher Arnold, who had started out

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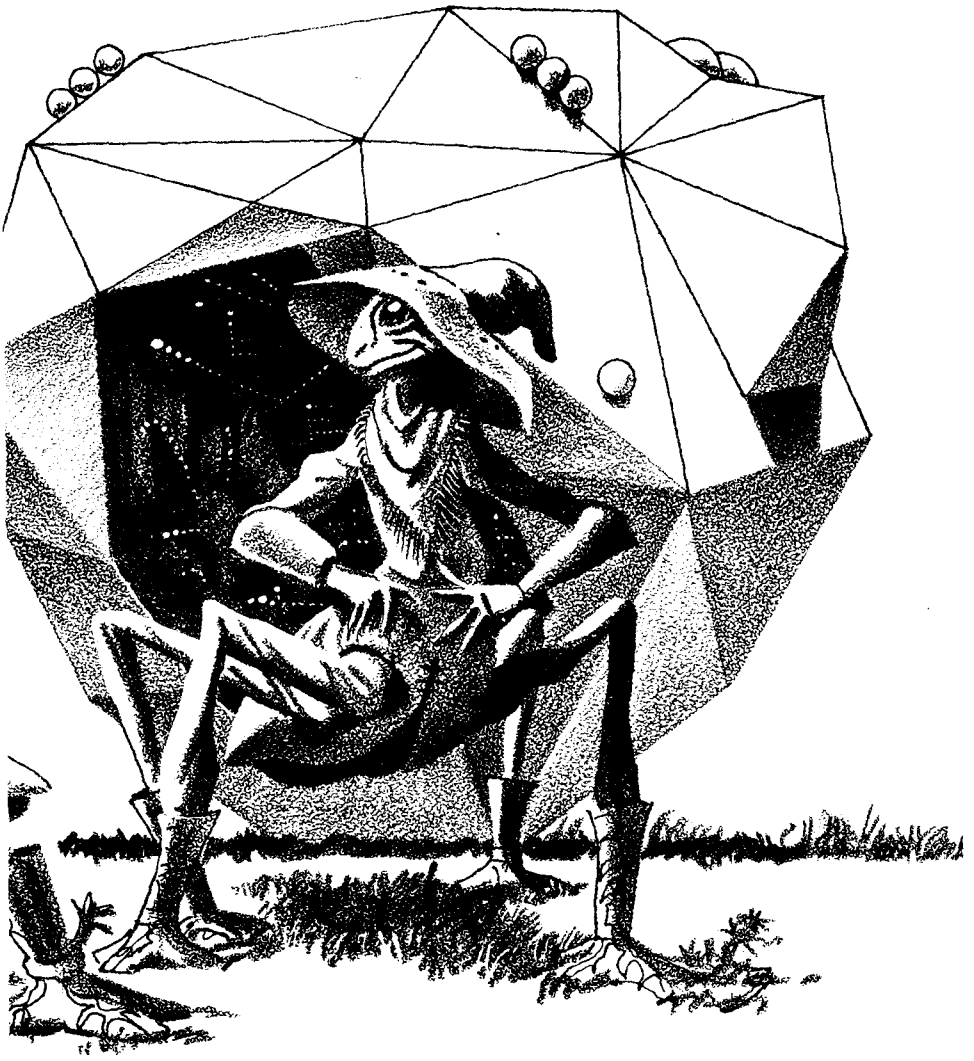

all wrong with Judge Miller, never expected to be drinking beer with him, and never dreamed he'd hear him called by his first name. He looked over at Nolan and smiled.

Nolan had had a few too many, but he was still not too far gone to look after Doc Barr, who was much worse off.

Doc let out a terrific belch—almost like the alien "cow." "Thass what threw me off. Damn furrin' cows belch—real cows don't. Regular cow woulda died right off, colicked up like that. Guess I'll have to learn to take care of 'em, though."

"Well, Mr. Arnold," said the judge,

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"have you changed your mind about frontier justice?"

"I certainly have. And it's a good thing I didn't get what I wanted the other day. The Bureau would have been fifty years living that one down."

"The whole secret is to take things slow; give them a good long look, and take only the action that's either safe or reversible. We've been a thousand years working the system out, and we found out a long time ago it doesn't pay to go off half-cocked.

"Now that sounds simple enough, don't it? You'd think people would understand. But there's always those who figure they know better; who want short cuts. Lately, there's been a whole lot of talk about tinkering with the constitution. Mostly, it's people who just don't take the time to think about the effects a change like that might have. Yet because I did, and because I had the constitutional obligation to stop you, we're all a whole lot better off."

Arnold nodded; took a bite of his bar-b-cued brisket. *Kinda stringy*, he thought. "What do you suppose the alien beef tastes like, Judge?"

"I expect we'll find out someday. Maybe real soon. Cowboys are cowboys, wherever you find them. Sooner or later we'll get invited to a bar-b-cue, maybe a rodeo too. And it seems to me that's a lot better basis for a relationship than what the politicians had in mind."

"Rodeo?"

"Sure, where did you think they were taking that cow? They were coming back from a show. She won first prize. Then the trailer broke loose from their pick-up out on the Interstar and wound up here. They'd set a booby trap to keep rustlers and predators away. Course, they'll have to pay old Eppler for the damage it did, but they donated a couple of pounds of gold to cover that. They'll be even in no time, what with the trading and stuff. You take a bunch of good, tough professionals in that kind of circuit . . ."

Nolan and Arnold looked at one another and shrugged a mutual shrug. They were the outsiders now, but it looked like the advent of interstellar relations was going to require a lot of contact with these people.

Arnold leaned over and whispered, "If this is going to go on I'll have to get my teeth sharpened, and it looks like it is."

"Yeh," said Nolan, fighting off an attack of hiccups. "It will. Diplomacy *is* mostly bull, you know." ■

•Conference: A place where conversation is substituted for the dreariness of work and the loneliness of thought.
•"A survey is being made of this": We need more time to think of an answer.
•"Note and initial": Let's spread the responsibility for this.

The Management Dictionary, Kelvin Throop III

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On Gaming

Dana Lombardy

Last month's column presented a list of award-winning SF and fantasy games. This column will take a closer look at eight of the sixteen still in print; the remainder I'll review next month.

Dungeons and Dragons® by TSR Hobbies Inc. (Box 756, Lake Geneva, WI 53147) changed the hobby of gaming. Introduced in late 1974, it contained the first set of rules for role-playing.

This is a game of heroic swords and sorcery set in a medieval world populated by humans, elves, dwarves, and many types of monsters. Two editions are available: a Basic Set with complete rules, sample monsters and treasure, referee instructions, and a beginner's adventure module; and the Expert Set with sixty-four-page rules book and module of assorted monsters, magic spells, and treasures for expanded adventures. An Advanced version consists of a series of hardcover books outlining more monsters, magic, and referee notes.

A large range of adventure modules are available for *D&D*®, or players can design their own adventure-story using the rules. A typical "module" includes a map of the dungeon to be explored, a list of rooms with treasure and monsters, and other notes.

Barbarian Prince, available from The Avalon Hill Game Company (4517 Harford Road, Baltimore, MD 21214), is a solitaire board game—no opponent is needed. In it you are Cal Arath, Barbarian Prince, in hiding from the usurper who killed your father and seized the throne. Your object is to raise gold and equip an army with which to regain your rightful heritage. Only a minimum of reading is required to start play, but it's difficult to win, and the game can be addicting.

Barbarian Prince comes with a nicely drawn full-color map showing temples, ruins, castles, roads, towns, forests, hills, etc.; two six-sided dice; a counter representing the Prince; two booklets (one of rules, the other of events); and a chart to track game turns, your food supply, and your endurance.

Car Wars by Steve Jackson Games (Box 18957, Austin, TX 78760) is for people who enjoy those movies of armed car- and cycle-gangs fighting for what little is left of Earch in the future. In *Car Wars* auto-duelling is legal in thirty-nine states, and a well-armed vehicle is a must if you live outside a major city.

The game comes in a unique plastic "pocket box" with 103 full-color, cardboard cut-out playing pieces representing cars, trucks, cycles, oil slicks, smoke and paint clouds, debris, pedestrians, mines, wrecks, etc.

Temple of Apshai by Epyx/Automated Simulations Inc. (1043 Kiel Court, Sunnyvale, CA 94043) is a solitaire game that can be played on any of five personal computers: Apple II with 48k; Atair 400/800 with 32k; TRS-80 level 2 with 16k or trsdos with 32k; Commodore 64 with 64k; and IBM PC/64k.

Your fighter travels from room to room in the temple labyrinth, defeating

(Continued on page 106)

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AND BE LOST LIKE ME

Joseph Green

Conflicts and their solutions tend to seem quite clear-cut when viewed from one side only. But consider the other. . . .

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"I see no indication whatsoever of a Siith'Staen personality imposed on my son's mind," said Jaime Bonaventura. He paced restlessly back and forth across the narrow room, unable to sit in the hard wooden chair before the computer.

The life-size male figure in the second wooden chair was a hologram. It too rose to walk the floor, keeping carefully within range of the hidden projection cameras. Jaime glanced at the tall but slightly stooped form, the balding head with a fringe of white hair around both ears, the serene, contemplative expression on the aged but still vitally alive features. The computer whizzes had done an excellent job of providing this interface persona with a look of wisdom and intellectual strength. Its name was Leonardo.

"I think it's much too early to form even a tentative conclusion," said Leonardo. The voice was a bit young for the image, the words slightly too precise, too clearly enunciated, to be human.

Jaime did not say aloud what he was thinking. *And if we disagree when the time* does *come? If I say my son is still human and goes free, and you say he is an alien and meat for the mind machines?* He had been assured a board of experts would make the final decision —but a suspicion lingered that the opinion of the Psych Tiger Team behind Leonardo would count far more than his own.

And his son's life was at stake.

Jaime realized his thinking was veering toward the emotional, and tried to pull back from that morass. If there was a Siith'Staen personality imprinted on Ernesto's brain, his son was already lost to him. Earth simply did not possess the techniques needed to remove such an intruder.

After his second session with Ernesto, Jaime had realized a subtle fact. There were no specific, infallible guidelines by which you could tell that an alien was hiding inside a human skull, if the new occupant had acquired a full set of memories from the original owner.

Leonardo sat down again, and waited. If Jaime continued pacing and talking, the persona would assume an expression of intent listening. Somehow Jaime could not bear to see that mechanically alert expression again at the moment.

Jaime turned and walked out. He had to resist an urge to say good-bye.

This was the fifth grueling day of a morning session with Ernesto, followed by a "discussion" with Leonardo, lunch, another agonizing three hours with his son in the afternoon, then one more with Leonardo. The strain was so intense he had started taking late-afternoon naps, before his solitary dinner in the hotel dining room.

Jaime headed for the small underground cafeteria in this hidden EDF Intelligence base under Langley Field in Virginia. He had absolutely no appetite, but must force himself to eat. He needed all the strength he could draw upon.

"Hello again, Neto."

The younger Bonaventura closed the door behind Jaime, then resumed his usual seat on the couch, leaving the only form-fit chair in the small but comfortably furnished room for his father. There was a cramped bedroom and small bathroom attached.

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"What incident out of my childhood are we going to talk about this afternoon?" asked Ernesto, his strained voice betraying that only a patina of patience overlay smoldering resentment. He gestured at the bare walls. "The hidden cameras and mikes are ready, the sensors trained on my body tuned up and humming, and the psych experts standing by." His face twisted into a look of angry despair. "Come on, Dad! Why are you being a party to this? And if you love me, as I'm sure you do, how can you be objective anyway? Why did they pick *you* for chief interrogator?"

Because I have the best chance of exposing you if you're not my son! Jaime thought, keeping his face expressionless. He stared at the young, tormented face of his only child, noting the shadows under the dark brown eyes. Neto was almost a copy of himself at the same age, twenty-five years ago. But there was something about those haunted eyes. . . .

At a time when he should be thinking up probing, revealing questions, Jaime's mind suddenly went blank. What appeared a second later was a fragment of a favorite old poem, one from a small book his own father, an Englishman, had loved and quoted to him often as a child. He had reread "A Shropshire Lad" recently, on the centennial of Housman's death. . . .

Look not in my eyes, for fear
They mirror true the sight I see,
And there you find your face too clear
And love it, and be lost like me.

And love it! . . .The Bonaventura genes were strong. He was looking into his own younger face, and beyond it to the four-year-old grandson Neto had named after him, and ahead into future generations . . . but was that the real Neto peering out of those dark and angry eyes? Jaime tried to look through the brown veils, into the mind behind them, and wished with all his being that he could read the thoughts swirling there. . . .

. . . Oh, the suspicion of these mean people! The hostility, the distrust! And this relentless man who comes here day after day, with love for a son in his heart, but determination in his mind —fear him, yes, fear him and all his kind . . . a bloody-minded species, killers all. . . . And I shall die here among them!

"Your mother called," Jaime said instead of answering Neto's question. "She wants very much to see you. Asked me to use my 'influence' now that I'm a full colonel, persuade the high brass to let her see you."

"I had planned to call her immediately after they let me talk to my wife and child." Ernesto stared his father squarely in the face. "And when is that going to be? What do I have to do to convince them—and you—that I really am still Ernesto Bonaventura? That they only tampered with my body, not my mind. I'm still *me*, Dad. Why can't you *see* this?"

Did I overplay that? . . . too much emotion, poor use of logic . . . no, Neto was never very logical . . . the memories, the words are there, but I must act the emotions . . . easy enough for a good pela *player . . . if only I can convince this grim old man I am his son . . . those hours spent studying this*

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young one in his rooms, practicing his walk, gestures, voice, every mannerism . . . only the finest of us were chosen for copy and imprinting, those who live their roles into reality, the ones who become!

Jaime had no answers for Neto's questions. His son had passed every test of memory and knowledge he could devise, sometimes stumbling and faltering if the incident was trivial or deeply buried, but eventually digging it out. If an alien now resided in his son's brain, he was able to get at the deepest, most remote memories that had once belonged to Ernesto Bonaventura. And his acting was superb, the voice and intonation flawless, the emotions and facial expressions perfect . . . it was unbelievable that this person could be anyone but his son.

. . . the pain in this man's eyes, the grief, the loss! . . . I would relieve his mind if I could . . . but then I would die. Die? How can I die? I am a copy of another person's mind, plucked out entire and implanted here as easily as these humans change a computer program. Why should I want to 'live' in this body. Why? Because it is the only one I will ever have! This young being's personality is gone, not buried awaiting resurrection! He cannot be restored, as I cannot be dislodged . . . but our medicnicians can complete the surgical process, turn me into an almost acceptable Siith'Staen, enable me to live, to mate . . . I must get home again. I must! The mind makes the being, not the changeable body!

"It isn't up to me to say, Neto. If it was, you'd be out of here by now."

And Jaime meant it. He felt an impulse to turn and walk away, tell Leonardo and the hidden Tiger Team that they were wasting his and their time. Ernesto claimed the Siith'Staens had placed him in a deeply drugged state, extracted every bit of information he possessed, then simply kept him captive until the prisoner exchange. Why couldn't Intelligence accept this?

Jaime knew the answer. Neto was the third person to be regained in prisoner exchanges. The previous two had returned together, relating stories similar to Ernesto's. Both had been false. The woman had given herself away somehow under questioning, and Earth Defense Forces Intelligence had called in the best medical brains in the world to try to remove the implanted personality. She had become a vegetable under their treatment. The male had never actually cracked—his mind started fading under their more careful and delicate probing, and he had committed suicide when a careless hospital guard gave him the opportunity.

Autopsies had indicated both brains to be perfectly normal. Whatever marvelous device the Siith'Staens had, it placed another personality in control without detectable physical alterations.

"It's bad enough they won't let me talk to my mother—I haven't even seen Alexandra and little Jaime!" The anguish in Ernesto's voice was real, the anger and torment on his face natural and normal. He hadn't been with his wife and son since the child was a year old.

Ernesto Bonaventura . . . following of his own volition in the footsteps of his father, a career military officer. Graduate of the Space Academy in Cen-

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tral Florida, marriage immediately after obtaining his commission, and advanced training for an eventual assignment in the Earth Defense Forces Sphere. Two years later, a first lieutenant and father, he reported for duty thirty million kilometers up, where he helped operate the small but powerful radar and telescopic eyes that guarded the planet below. And after only eight months, in the last massive attack the enemy had launched, he had been plucked from space after his radar station was destroyed, alive and uninjured. The aliens made a practice of examining demolished structures, and saving anyone left alive.

The Siith'Staens had appeared twenty years before and confirmed the worst fears of xenophobic humanity: that intelligent beings from other star systems might be hostile. They had demanded tribute in the form of enormously complex machinery, products that would have occupied all the resources of Earth's vast aerospace industry. They also ordered an end to all efforts to build a ship capable of interstellar travel.

Earth had refused. That had led to some punishing strikes by the aliens, with several million lives lost. But though Siith'Staen technology was superior to that of Earth, it was not unacceptably far ahead. The amount of firepower they could bring to bear across interstellar distances was limited. Humanity had survived.

External war had caused a forced but rapid amalgamation of all nations into one strong world government. The new Earth Defense Forces had absorbed every existing military body and institution. Instead of paying tribute, united humanity built an enormous force of defense ships—and the Sphere Alert System. The EDF had met the last two Siith'Staen task forces as they approached Earth and beaten them, at great cost, through overwhelming force of numbers.

Jaime had fought in both those desperate battles. Before that he had been in several "forced contribution" skirmishes during the early days of military consolidation, when a number of smaller nations refused to merge their armed services into the Earth Defense Forces. He found it easy to risk his own life, when duty demanded and the course of action was clear. But in this swamp of alien psychology, personality imprinting, and memory stealing, he felt lost, alone, and vulnerable. He needed an enemy you could see and fight.

"I believe this ordeal will be over soon, Neto. I don't think they've found anything whatever that indicates you've been taken over, and they'll soon have to admit it." Jaime had remembered an incident out of Ernesto's childhood as they spoke, and decided to run it as a final test. If Neto passed this one, he was going to tell Leonardo he was through. Enough was enough.

"Neto, do you remember the first time we went sailing on Chesapeake Bay, when you were seven?" Jaime was watching his son's face as he spoke, and saw a familiar resignation replace the perpetual anger. They were going to play games again.

"That was our first day out in a sailboat, and you fell off," Jaime continued. "I had to drop the sails very quickly and dive in after you. You were wearing a lifejacket, but the waves were

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pretty high. Your mother got the auxiliary motor started, turned around, and came after us, but by that time the waves had knocked you over twice and you had swallowed some water. I held your head up until she got there, you coughed up a little water, and were okay. Next day I not only made you go out with us again when you didn't want to, I forced you to take the tiller and taught you how to handle the sails. Why did I do that?"

Ernesto had begun his second day of sailing in fear and trembling, and ended it in pride and triumph. They had never discussed it since, though the boy had gone on to become an expert small-boat sailor.

. . . Quickly now, that should be an easy one . . . yes, strongly engraved in the memory banks, the incident and its aftermath . . . so clear, so sharp . . . something tricky here? Play it safe regardless, a straightforward reaction . . .

Ernesto looked his father in the face, as was his old habit. "Why, it was the famous get-back-on-the-horse bit, of course. You knew I'd be afraid of sailing for the rest of my life if I didn't go right back out. On that day I hated you for it, for making me feel so scared, but by the time we got in I knew you'd been right—as usual."

That was the correct answer, one an alien not intimately familiar with human psychology might well have missed. Jaime felt a small stir of triumph. But then he realized that Ernesto might have discussed the incident with his friends, or analyzed it himself in later years. If so, the alien could be drawing on a submerged memory, not reacting to an original question.

. . . Baffled, that stopped him . . . no great subtlety in this man, just strength and persistence . . . like my own father . . . why did we draw the task of slowing these people down until their social development equals the technical? Why the Siith'Staens who must confine them here? . . . because we were so recently admitted to the community ourselves? . . . a testing ground for us? . . . we listened, they held us back without bloodshed, while generations grew old and died learning to live in harmony . . . are we clumsy amateurs, resorting to force when better ways were available? . . . too late now . . . must see it through. . . .

Jaime sighed, but only internally. He had not proved anything after all. For the thousandth time he looked back over the years he and Marla had spent raising their only child before the divorce, seeking some event, an action and response, which the young one would not have understood, and an alien might not comprehend now. There was the one and only time Ernesto had committed a theft. . . . He searched for a way to phrase the question that would give away a minimum of information. He could at least finish the afternoon session before telling the Tiger Team to go back to their jungles.

"We have the final reports in from the physiology team, Jaime," said Leonardo, sitting very erect in his hard chair. "I have a printout of the summary for you, but you may want to discuss the implications. Based on what we know of the Siith'Staens' home planet, Ernesto can now live there with only minor discomfort, and even that could

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be relieved through further surgery. The aliens have strengthened his heart, modified his central nervous system chemical balance, added a liver enzyme apparently needed to digest the vegetation there, and started a rather subtle process that is slowly making all the major veins and arteries both stronger and more flexible. The entire human species could benefit from that one. There are also some other minor changes. The sexual organs have not been touched."

Several Siith'Staen bodies had been recovered almost intact, enough to tell a great deal about their home environment. They were apparently from a world of about 1.4-G surface gravity, and had developed about as theory predicted. They were on the average slightly shorter and somewhat more massive in build than humans. But there was room for many variations within the larger parameters, and their sexual apparatus had emerged in a quite different form, totally separated from the excretory functions. The male organs were attached to a muscular patch of tissue just below the navel. The female receptacle was in the equivalent position, directly above the uterus. And both were less than half the size of the normal human organs.

If Ernesto was now an alien who planned to return to his adopted home planet, further surgery could obviously make it possible for him to take a Siith'Staen female as a mate. The enemy doctors had apparently stopped at the point where Ernesto could still live on Earth and function as a physiological human—but be converted to a Siith'Staen with a few more operations.

And that was a very suspicious stopping point, to EDF Intelligence.

One of the most difficult aspects of this situation was that not enough was known of Siith'Staen psychology. It might be within their normal behavioral modes to perform medical modifications on a long-term captive to make him comfortable on their planet, while carefully avoiding any changes that would render him unfit to live among his own people again.

"Have you formed any conclusions from this data?" Jaime asked Leonardo, hoping to hear something that had not occurred to him. But Leonardo might have been reading Jaime's own mind when he replied.

Jaime wondered what devilish turn Siith'Staen science had taken, to enable them to transplant personalities as if they were hearts from the organ banks. Did they clone themselves, grow vegetable brains kept asleep by drugs, then transfer the essence of the living mind when the old body began to fail? Was the transfer once-only for alien brains, but unending among their own kind? If an individual carried a full set of memories from body to body, was that not a form of . . . immortality?

These were profound questions, and unanswerable at present—but one fact was certain. The aliens were further ahead of Earth in physiology than in physics . . . and it was a shame they were so hostile it was impossible to learn from them.

"I have made a decision, Jaime," said Leonardo, arousing as though from deep thought. That probably meant the Tiger Team had been feeding the computer a new set of inputs. "Tomorrow

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we are going to let Ernesto be with his family, under carefully controlled conditions. We think exposure to the company of his wife and child will provide many new reactions which we can weigh for authenticity."

Jaime knew his face must have reflected his surprise. Not even he had been allowed to see his daughter-in-law since this interrogation began. And though he felt no real warmth toward Alexandra, the four-year-old grandson was the joy of his life.

"What are these 'controlled conditions'?" Jaime asked. Leonardo told him.

"I don't understand why I can't be alone with Alex and little Jaime," said Ernesto. The underlying sullen anger and resentment were still apparent in his voice and on his face. He and Jaime were sitting in the shade of some massive water oaks on the north bank of the peaceful James River, several miles northwest of Newport News. At this point the wide but slow-moving James was little more than a large lake. To the east it widened still more to become Hampton Roads, the site for over 200 years of the major naval installations of the former United States of America. The ships that now moved from Hampton Roads into Chesapeake Bay were usually bulk carriers, and the navy of United Humanity did its fighting in space—but still this was one of the primary concentrations of military power in the world.

Several hundred meters to the southeast Jaime could see the rounded dome of the Hampton Power Plant and the two low cooling towers that drew great volumes of water from the James, to be returned several degrees warmer. The two huge intakes for the water cooling system protruded far into the river. On the closest, the series of protective grilles that screened out solid objects had been lifted up and locked in place above the wide but shallow ducted inlet. A maintenance crew, two of the workers dressed in scuba gear, was cleaning the encrusted metal and repairing the heavy grillework. The area was posted with signs warning away boats and swimmers. A sister plant, Jaime knew, was located less than two kilometers upriver, but hidden from them by an intervening low hill.

He tried to answer Ernesto's question. "The psychs aren't doing this for your benefit, Neto. Probably half this crowd—" he gestured toward perhaps a hundred people lazing in the park and swimming area "—are members of the interrogation team. There are telephoto cameras recording your every move, each expression on your face. You know this; so why not just relax, and enjoy being with your wife and child as much as you can."

Ernesto heaved a sigh of exasperation, but the sullen look eased. "I suppose you're right. I shouldn't have expected more." He stood up and walked to the edge of the low bank, gazing out over the river. Alexandra and the boy were frolicking and playing in the water a hundred meters upstream, near the farthest edge of the rope barrier that defined the safe swimming area. The child, wearing water wings, was laughing and splashing happily. The sun was near the horizon, the air cool. They were the only people still in the water.

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It had been a restful, peaceful four hours for Jaime. For Ernesto and Alexandra it had been a harrowing, awkward ordeal. She had tried with great earnestness to open up to her young husband, but the thought that an alien might be lurking behind the familiar face was apparently more than Alexandra could handle. She had alternated from overly self-conscious approaches to almost frightened withdrawals. Only little Jaime, too young to be afraid, had been unabashedly enthusiastic about meeting the father he had not seen since he was a baby.

Jaime rose and joined Ernesto, sneaking a quick look at his averted face.

. . . how pleasant here, despite being watched . . . the attractiveness of this woman, even though too tall and thin, as are they all . . . could this pela *player perform his greatest role on this world, blend in, truly* become? *. . . to assume the life of Ernesto Bonaventura . . . I've always wanted a child . . . the strangeness would fade, I think, with time . . . to be her husband . . . a* pela *player has many partners, but never a mate . . . not for him or her the 'long love,' the twining that endures . . . but the Lords of Show promised me new and exciting rôles if I return, major recognition playing the rôle of killer humans . . . a new series of* pela *plays, myself as prime antagonist . . . But can I live through this, can I endure? I am only an electronic pattern, beginning life as a copy of a real being . . . but this experience, this body, have changed, matured me . . . I feel that I am a person now . . .*

Why did my people do this to me? . . . I WANT TO LIVE!

As the two men stood gazing out over the river, a wall of water over two meters high suddenly roared around a bend in the shore, 200 meters upstream. It bore down on the swimming area with terrifying speed. Jaime suddenly realized he had been hearing a low, distant rumbling for the past minute, without identifying it.

"The west plant—they must have had an emergency storage water dump!" Jaime raised his voice to a shout. "Alexandra! Come ashore! Quickly!"

Alexandra had also heard the low roaring sound. She turned and saw the advancing wave, grabbed little Jaime, and headed for land. But she had taken only a few slow steps in the waist-deep water before the onslaught of dirty foam reached them, washing away the anchored rope barricades and knocking her off her feet. Very suddenly she was in water over her head, swimming with one arm, fighting to keep Jaime from being swept away and herself dragged under.

Fortunately, Alexandra was an excellent swimmer. She managed to keep herself and little Jaime afloat on the crest of the wave. But within seconds they were swept downstream from the swimming area and toward the open, wide mouth of the nearest power plant water feed.

Ernesto stood as though frozen, obviously uncertain what to do. Jaime analyzed the situation in one quick glance, and saw a slim chance to get Alexandra back to shore before she and the boy were swept into the giant intake. "Come on!" he almost shouted at his son, and set off at a run for the shoreline, angling sharply back toward the east.

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Jaime had spotted a shallow place where a sandy shelf extended well into the water. If they could reach it and be far enough into the river when the wave hit, there was a chance two strong swimmers could catch the struggling woman and pull her ashore this side of the inlet.

Jaime watched the water as he ran, Ernesto at his heels. The wave was slowing as it spread out over the wide expanse of the James, but still moved with great force. The experience gained from studying thousands of tactical military situations helped Jaime calculate the odds. They were already at the shoreline, and could get far enough out to catch Alex and little Jaime . . . but with despair he estimated there was very little chance they could get to shore again. The water was still moving with too much speed and power, and the inlet was now only forty more meters downstream.

Jaime was still wearing his swimming trunks. He had kicked off his sandals as he ran. Well out into the water, he suddenly realized he was alone. Jaime wasted precious seconds glancing back over his shoulder. Ernesto stood barely into the water near the edge. He too had been estimating the speed of the flood, and had stopped when he saw they had almost no chance of getting back to shore.

"*Come on!*" Jaime yelled, a single time . . . then devoted all his attention to splashing through the shallow water without losing his footing.

"*No, come back! You can't make it! You'll drown too!*" Ernesto's voice was a hoarse scream.

Jaime plunged ahead, saving his breath for the coming swim. He was barely in time to position himself in front of Alexandra before the flood arrived, knocking him off his feet. Swimming strongly, he shot back to the top, close to where his daughter-in-law and grandson were being carried along, now well behind the crest of the flood.

Alexandra looked frightened, but she had kept her wits. She thrust the boy at Jaime. He took him with his left arm and turned on his right side, stroking hard for the shore. Alexandra kept up with him, now that she could swim with both hands.

Jaime risked a quick glance downstream and saw with bitter hopelessness that his original estimate had been correct. They were being taken toward the open mouth of the intake, so strongly there was no chance they could pull away and curve around it.

And even as he looked, the grilles which had been raised all afternoon suddenly slid downward, locking into place with gurgling mechanical clicks. Now nothing larger than a minnow could be swept inside. Seconds later Jaime suddenly felt an arm lock around his waist, another body against his in the water. He looked down, to see a dark form hovering a little beneath the surface. It was a man-shaped creature in a black wetsuit, with goggles over the eyes and three cylinders strapped to its back.

A trail of bubbles shot from the central cylinder, and Jaime felt himself accelerate through the water. He recognized the equipment. This was a military diver, wearing oxygen tanks and a small but powerful hydrogen peroxide jet propulsion unit.

To his left, he saw Alexandra also moving rapidly toward the shore, almost

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riding on a dark form that supported her from beneath.

And in less than a minute they had reached the roiling backwater between inlet and shore, and seconds later were in shallow water. Their speed eased, and then he was released. Jaime stood erect, holding little Jaime. The worst of the flood was past them, though the normally peaceful river was still agitated with stray ripples and swirls.

Both mobile mariners turned, without getting to their feet, and vanished back toward the deeper water, bubbles bursting behind them.

"So you aren't actually a hundred percent certain?" Jaime asked Leonardo.

The wise and somewhat weary countenance turned to look directly at Jaime. "No, but in this case there is little chance of certainty. The odds are estimated as better than twenty to one that the real Ernesto Bonaventura, faced with the simultaneous loss of his wife and son, would have risked his own life to save them, so long as there was any chance at all of success. Everything in his psych profile prior to capture indicates this."

"And this whole elaborate game was set up so Neto would encounter a situation he hadn't previously faced, where the alien wouldn't have applicable memories to draw on for the correct reaction?"

"Yes. The Siith'Staens, to the best of our limited knowledge, do not share our human characteristic of willingness to risk one's life against great odds for a member of one's gene pool. Their loyalty is toward preservation of the self, first and always. Only when that objective is not at risk will they help others. It is not a form of cowardice, or even selfishness. It is a strategy for the preservation of gene carriers that differs from our own. We feel that is one reason they developed the ability to copy and imprint whole personalities. Such artificially created beings can be sacrificed without compunction. Fortunately for us, the basic drive to preserve the self first under any circumstances is a part of the imprint pattern, and subject to detection."

"And you didn't tell me what was coming so my own reactions would be completely authentic?" Jaime tried to keep his voice emotionless, but he knew the strong resentment showed.

Leonardo ignored the emotional content, concentrating on the words. "That is correct. There was no question in the alien's mind that this life-threatening emergency was an arranged test. What he had to ask himself was whether your example was worth following, or whether you were trying to lead him astray." Leonardo paused, as though thinking. "He had insufficient data with which to answer that question, and was forced to rely on his own cultural norms—which betrayed him."

"And what will happen to Neto now?" Despite the knowledge his true son was irretrievably dead—he had known this for a certainty when he glanced back over his shoulder and saw Ernesto stopped in the safe shallow water—he felt a sense of outrage at what must be done with the body.

Strangely, there had been little new grief to endure. Somehow he had known for days, on some deep level not avail-

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able to his conscious mind, that this walking, talking simulacrum was not his son. The final confirmation had healed more than it hurt. Alexandra had felt the change also, though she had less confidence in her own reactions. She had not wanted to believe . . . and neither had he, neither had he!

A gentle smile appeared on Leonardo's aged lips. "Why, we are going to return him to the Siith'Staens, of course. They can complete the remaining needed surgery, and let him live among them. He will go back to them on the next prisoner exchange."

"I'm—glad. Thank you for that." There seemed no more to say. Jaime rose to leave, concluding this shortest of debriefings. He said good-bye to the persona and turned away.

Alexandra and little Jaime were waiting in a room in the motor pool off the hidden entrance to the underground. The boy came running toward his grandfather, chubby legs carrying him across the tiled floor with breakneck speed. Jaime bent and scooped up his grandson, whirling him around and around as he spun on his heels. Suddenly he felt like laughing, for the first time in a week. Out of the corner of his eye he saw Alexandra, smiling with quiet amusement, and wondered why he had not previously liked her.

His son was gone, but their genes had been preserved in this healthy youngster who looked so much like his father and grandfather. And that was the major drive shared by human and Siith'Staen, which might eventually bring peace between them.

Jaime held the wriggling boy in one arm and placed the other around Alexandra's narrow shoulders. "Let's take this lad to see his grandmother," he said, and led the way out. ■

IN TIMES TO COME

● Some time back Timothy Zahn had a popular story here called "When Jonny Comes Marching Home," about the problems of a technologically augmented warrior in readjusting to civilian life. The problem, you see, was that a lot of his weaponry was built in—permanently—and ordinary people just couldn't feel comfortable with that. The solution was to ship the "Cobras" out to colony worlds, where their special powers could be put to necessary, peaceful uses. But suppose, then, that you have such a colony which depends heavily on exploiting those capabilities, and the Cobras themselves feel they're being treated unjustly. Their gadgets are still applicable to their original purposes, you know. . . . The story is called "Warlord"—and by all means feel free to jump to wrong assumptions about what that means. You'll be that much more likely to find a surprise or two when you read it.

We'll also have the conclusion of Lee Correy's *Manna,* a thought-provoking article by M. David Stone on "The Search for Terrestrial Intelligence" (yes, you read it right), and a guest editorial which Arthur C. Clarke has called the most important piece he's ever written.

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TECHNOLORATA

HACK placidly amidst the noisy printers and remember what prizes there may be in Science. As fast as possible get a good terminal on a good system. Enter your data clearly but always encrypt your results. And listen to others, even the dull and ignorant, for they may be your customers. Avoid loud and aggressive persons, for they are sales reps. If you compare your outputs with those of others, you may be surprised, for always there will be greater and lesser numbers than you have crunched. Keep others interested in your career, and try not to fumble; it can be a real hassle and could change your fortunes in time. Exercise system control in your experiments, for the world is full of bugs. But let this not blind you to what virtue there is; many persons strive for linearity and everywhere papers are full of approximations. Strive for proportionality. Especially, do not faint when it occurs. Neither be cyclical about results; for in the face of all data analysis, it is sure to be noticed. Take with a grain of salt the anomalous data points. Gracefully pass them on to the youth at the next desk. Nurture some mutual funds to shield you in times of sudden layoffs. But do not distress yourself with imaginings—the real bugs are enough to screw you badly. Murphy's Law runs the Universe—and whether or not it is clear to you, no doubt

$$\oint_s \mathbf{B} \cdot \mathbf{n}\, dS = O$$

Therefore, grab for a piece of the pie, with whatever proposals you can conceive of to try. With all the crashed disks, skewed data, and broken line printers, you can still have a beautiful secretary. Be linear. Strive to stay employed.

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THE ANALYTICAL LABORATORY

Many thanks to all of you who voted on our 1982 stories, articles, and covers—and now it's time for the results. As you probably recall, we asked each of you to list your choices for the top three items in each category: novelettes and novellas, short stories, fact articles, and covers. A couple of hundred of you responded, which is pretty good, but we'd like even more next year. The more we know about your likes and dislikes, the closer we can come to giving you what you want.

In the listing that follows, the score given after each title is a number on a scale of 0 to 10 obtained by counting every first-place vote as three points, second place as two, and third as one; dividing the total for each title by the maximum possible; and multiplying by 10. A high number means high popularity within a category, but you can't compare numbers in different categories because scores necessarily run higher in categories with fewer entries. In parentheses after each category heading I've put the score each item in that category would have received had all been equally popular.

Here are the results:

NOVELLAS AND NOVELETTES (0.69)

1. "Pawn's Gambit," Timothy Zahn (2.18)
2. "Collaboration," Mark C. Jarvis (1.63)
3. "Green-Eyed Lady, Laughing Lady," Alison Tellure (1.61)
4. (tie): "Brainchild," Joseph H. Delaney (1.38)
   "The Scourge," James White (1.38)
5. "My Brother's Keeper," Joseph H. Delaney (1.30)

SHORT STORIES (0.65)

1. "Melancholy Elephants," Spider Robinson (2.04)
2. "Garden of the Cognoscenti," Michael P. Kube-McDowell (1.18)
3. "Walk With Me," Rob Chilson (1.04)
4. "Schrödinger's Plague," Greg Bear (1.00)
5. "Who Will Guard the Guardians?", Catherine and Michael McCollum (0.91)

FACT ARTICLES (1.54)

1. "New Communications Technol-

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ogies and the Developing World," Arthur C. Clarke (2.71)
2. "Exploring the Asteroids," Joel A. Davis (2.52)
3. "Alien Sex," Dr. Robert A. Freitas, Jr. (1.99)
4. "Space Transportation: You *Can* Get There From Here!", Gordon R. Woodcock (1.94)
5. "The Inner Five," George W. Harper (1.88)

(NOTE: Richard C. Hoagland's "The Blivit in the B-Ring," Part I of which ran in December, received a good many votes, but since it's a two-part article concluded in January, it really belongs in the 1983 AnLab. So we did not count it this year, and renumbered the other votes accordingly on ballots that mentioned "Blivit.")

COVERS (1.54)

1. July: Rick Sternbach, for "Rings of Glory" (4.88)
2. February: Val Lakey/Artifact, for *Courtship Rite* (3.77)
3. August: Kelly Freas, for *Rails Across the Galaxy* (2.85)
4. Mid-September: Paul Lehr, for "He Who Fights and Runs Away" (1.83)
5. September: Vincent Di Fate, for "The Manna Hunt" (1.74)

Once again your votes showed a much greater concern for the product itself than for who produced it, as reflected in the frequent appearance of new or almost-new writers in the top places (one of them twice!). As usual, the final numbers don't tell the whole story—for instance, this year Timothy Zahn rated a first place with "Pawn's Gambit," while last year he probably got more total votes than any other author—but distributed so evenly among his several stories that none of them made the top five. The original ballots also show, as the final scores cannot, the great diversity of your tastes: *everything* we published received at least some votes.

The diversity of tastes was even more evident in your comments on our two serials, *Courtship Rite* (by Donald Kingsbury) and *Rails Across the Galaxy* (by Andrew Offutt and Richard Lyon). Both received lots of praise, but both were also soundly panned by some. These two comments are typical of the range of reactions to a single story:

"*Courtship Rite* is the best-realized alternative civilization story I have ever read."

and

"*Courtship Rite* was poorly written, very confusing, and generally dull reading."

Many of you commented on the great contrast in style and tone between *Courtship Rite* and *Rails*, saying you liked both (many found the light touch of Rails refreshingly unusual) but could not really compare them because they were both good in such fundamentally different ways. That's the way I'd like it every year. Authors, please note!

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Galem went on exploring upstream, in search of the thickplant he needed to cure the child who, back in the village, was dying of withering disease. He was oblivious to the blue skies, the mild weather, the river that meandered and cascaded as it coursed around hills and mountains, and the foodplants that grew in plenty by the riverside. All he had in mind was the thickplant, and he couldn't find it.

Galem had been impatient all day. Now, in the afternoon, he was growing desperate. He was starting to doubt if he would ever find more thickplant and, if he did, whether or not he could return in time to save the child's life.

No one had ever before ventured so far away from the village, nor faced the possibility of having to sleep alone in the wilderness. All day long Galem had had to fight against the urge to turn heels and return, even if empty-handed. He missed his people terribly, and the fact that it was too late now to get back before nightfall only made him feel more weary and miserable.

Yesterday, after the evening services, he had been asked to see the sick child. Yesterday—Galem slackened his pace as he reminisced, half in puzzlement and half in fear.

Yesterday morning the sky had been gray for the first time in anyone's memory, and everybody had been late for morning services. They had all been drowsy and complained of numbness in their skins and of a sharpness in their chests as they breathed. The sky had been blue by the time the services were over, and all had felt well and happy again. All but Galem, who had become worried.

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Edmundo Hamiltowne

TO CURE TO LOVE TO SURVIVE

There are certain kinds of experiments in which success can be claimed only when the experimenter is obsolete.

Gary Freeman

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Unlike his carefree fellow villagers, Galem had studied the drawings on the walls of the Temple of Wisdom, and had wondered if what his people had felt was related to that drawing where, under a grey sky, the villagers were entering the Temple; or to that other one where, under grey skies again, the women were taking their eggs to the firecave. The latter had impressed Galem so much that he refused to mate until understanding its meaning.

At any rate, when called to go see the sick child, Galem had immediately gone to the thickplant that grew near the village, by the riverside. To his dismay, all that remained were its red branches. Aside from its usefulness in preparing red paint, Galem had found that it was helpful in curing the deadly withering disease, so he had used it to treat several children. He had been so euphoric, in fact, that he had even used it in a vain attempt to cure an elderly blind man, whose handicap had horrified Galem ever since childhood. Everybody had availed themselves of thickplant so freely that Galem had found none when he needed it yesterday evening. So early this morning, Galem had started his journey upstream because, and although he was now verging on despair, he had figured that the river could well have brought the seed of thickplant to the village, in the same way it had brought downstream pebbles and boulders.

Lost in thought, Galem went around still another hill and lo! right in front of him stood a bush of thickplant growing by the riverside, big enough to supply his needs for a long time to come. Its red color contrasted with the greens, blues, and ochres of the foodplants that grew around it.

Galem ran toward the thickplant, crouched by it, and started to caress its thick, red leaves. The relief at having reached his goal made him acutely aware of his desolation, and also of the fact that perhaps he wouldn't be back in time to save the child. Galem broke into moans and rocking movements.

Suddenly he stiffened, his grief forgotten. The breeze was bringing to his sensitive nostrils an odor that was impossible in that wilderness: that of Kala, the woman he loved, in a self-induced rut. Startled, Galem stared upwind, sniffing the air, while his mind attempted to restrain him from mating. There was nobody in sight, though the enticing odor was still there. Galem started to run upwind. He couldn't believe that Kala could be around, that anybody but he could have braved such a journey into the unknown. Galem ran around a boulder and almost bumped into Kala.

"Kala!" he somehow managed to stammer. "What are you doing here?"

Her eyes aglow, Kala started the nuptial dance instead of answering; a melting combination of sensuous sighs, chatter, laughter, movements and caresses. Galem's defenses vanished and not long afterward they mated, only too keenly aware of the silence caused by the absence of their fellow villagers.

The rim of the sun touched the horizon by the time they finished, so they both knelt and said their evening prayers.

Galem went to sleep with a heavy heart at having made Kala pregnant, but his last thought was for the sick child. Kala went on happily chatting, laugh-

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ing, and caressing him until she fell asleep, too.

The ship of the Gods came out of the space-time warp near a white star. Around it a single, moonless planet was in orbit. The Gods soon learned that the axis of the planet was perpendicular to its orbit, and that the orbit was quite eccentric. They also learned that the planet had a molten core, enough oxygen, and plenty of water, and that the northern hemisphere was lifeless; whereas the southern had, in some spots, developed life only as high as primitive plants.

The Gods decided to take a closer look to see if the planet could bear intelligent life, despite its very cold winters when farther away from its sun. They entered the planet's atmosphere in mid autumn.

The Gods landed in a life-bearing area, going easy with the ship's antigravs; then trod carefully around in sterilized spacesuits, all in order to disturb the local ecology as little as possible.

Three were the Gods. The Father, tall, white-haired and -bearded, and with a grave countenance; the Mother Goddess, beautiful and intelligent-looking: and their Child God, lovely in his mid-childhood.

The Mother Goddess fetched samples of the vegetation that grew along both sides of a rill that meandered around boulders, and reentered the ship. The Father and Son Gods were staring expectantly at the hatch when she emerged.

"Do you think you can engineer intelligent life here?" the Father God asked her.

"I can try," she replied. "Come and see what I think I can make."

The Father and the Son followed her into the ship's large main cabin. Atop a low platform stood two small 3-D holos. Both were humanoid, and their skins were pale red. Their heads were round, hairless, and had two openings where their ears should be. Their necks were practically nonexistent, their bodies cylindrical, and their limbs similar to those of humans. One of them, taller and more muscular than the other, had a penis hanging from its lower mid-abdomen.

"Is that their actual size?" asked the Father God.

"Yes," answered the Mother Goddess. She pointed at the head of one of them. "They have no predators, so they need no directional ears. Their sense of hearing will be quite keen though."

"Where are his testicles?" asked the Father God, pointing at the male holo.

"They are internal. These creatures are going to be cold-blooded. Their reflexes and perceptions are going to be very fast, though, due to their small size."

"But why will you engineer them cold-blooded?"

"Not enough food."

"Will they be able to survive the winter?"

"Not until they learn how. But they are going to be oviparous. We'll find a way for their eggs to survive."

The Father God nodded. "We'll find a way. But you'll have to engineer them so that enough generations live through each summer. It's the only way they can create some kind of a society, that they

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can gather some sort of collective knowledge."

The Mother Goddess left for the adjoining lab, to return after some time. She said, "I can make up to four generations per summer."

"That will be enough?"

"But what is the point of the four generations?" asked the Son God. "They'll all die in winter!"

"Until they learn to survive, my son," replied the Father God.

"But that's a cruel fate, Father!"

"Learning is never easy, my son," answered the Father slowly.

All three donned their spacesuits, went to the sterilization chamber, and then to the ground.

"Winter is almost here," the Father God told the Mother Goddess. "Better engineer their eggs." Then he pointed at the foot of the highest hillock. "I will make the hatching cave there. I will make it so that the core heat assures a constant warmth inside during the winter, and I will make it huge. And you will also have to engineer the food for the newly hatched. Do you think you can manage?"

"I can manage. I can make their senses of taste and smell so that they'll find that food appetizing during the winter, though repellent when the warm weather sets in. Also I can engineer it so that any child or adult can survive the whole winter on it."

"I will make another cave, adjoining the one where the eggs will hatch, in which to grow the food." The Father God pointed at another hillock nearby. "I will pock its surface to make caves where they can dwell in summer. And I will also build them a big Temple."

Then he stared at the Mother Goddess, pain and anger and frustration in his eyes, and also infinite love and compassion. "Can you make them with no competitiveness, with no desire to conquer or to plunder? Can you make them loving and religious, and respectful of each other and of their environment?" He choked as his eyes filled with tears. "We cannot condemn them to suffer a fate like our own."

The Mother Goddess embraced him as his Son took one of his hands in both of his. All had tears in their eyes.

The Mother Goddess said softly, "I can and I will, my love."

"And I can construct a marvelous altar shaped like an egg with that beautiful red marble of the northern hemisphere. I would like to place it inside the hatching cave. That way they will know where to place their eggs when winter comes," said the Son God. "Father, can I fetch a shuttle and some robots to get the marble?"

"You certainly may, my son. And bring a slab big enough so that I may make an altar for their Temple." Then the Father God addressed his wife, "Make them fearful of fire as a last precaution. Without fire there is no possibility of plunder. And now to work!"

The Mother Goddess fetched several more samples of vegetation.

The Son God asked her, as she was about to go aboard, "But what will happen if they fail to survive?"

The Mother Goddess stared sadly at the plants she carried in her hands. She said, "Then I will have to engineer another prototype."

Snow was thick on the ground by the

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time the Gods finished. The eggs were safely stacked around the egg-shaped altar inside the hatching cave.

The Gods then left, to return at the spring thaw and again at the end of the fall. To their increasing sorrow and dismay, only the eggs survived the winter, and all the creatures died at the end of the fall. Again, and again, and again.

Galem and Kala awoke when the rising sun warmed the air and the ground. Both knelt facing the sun to pray, then ate several varieties of foodplant and drank river water. After breakfast, they fetched all the thickplant they could carry in both hands and returned to the village. During the trip back they chatted and laughed, caressed and chased each other, splashing in the river. All this frolicking, Galem's love for Kala, and the budding tenderness he felt toward the life now growing within his wife, helped to make yesterday's gloom disappear. Now the sun was bright and the sky was blue, and the river sang and sparkled, and the rainbows were beautiful in the waterfalls. Now the breeze felt nice on the skin and filled the air with the aromas of the foodplants that grew everywhere.

First they saw the plume of smoke that rose from the top of the firecave mountain when they approached the village. Next appeared the lake; for in the times of their grandfathers the heat had been so great that they had built a dam with boulders, in order to bring the water and the foodplants closer to their dwelling caves.

Galem's heart sank when they arrived in the village. A funeral ceremony was taking place. Beyond the dam were the villagers, moaning and rocking in their grief. His father, presiding over the ceremony, had cast the remains of the deceased into the river. Galem and Kala ran toward the mourners.

"Who has died?" Galem asked one of them.

"The poor blind man."

Galem restrained his sadness, his desire to moan and to rock, because he was worried about his patient. He asked the same villager, "And how is the child?"

"He's dying, Galem."

Galem and Kala ran toward the Temple of Wisdom, empty now. Galem fetched a stone mortar that stood by the altar. The concavity of the mortar, a large pebble hollowed by the action of the water, was red from all the thickplant Galem had macerated there. Galem ran to the river and filled it with water. He also placed a round pebble inside and started toward the sick child's cave.

The funeral ceremony was over. His father returned to the Temple of Wisdom as the villagers surrounded them, their grief forgotten. They were full of appreciative hisses, of laughter and chatter and curiosity about what had happened to Galem and Kala. Plus a lot of caresses. The din of the hisses increased when the villagers learned how far they had had to go to get the thickplant, and much more when they were told about Kala's pregnancy. The women were particularly thrilled about the setting where conception had taken place, and forecast great events in the child's life.

It was so wonderful for Galem to be again with his people! Although worried about the sick child, Galem couldn't

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help enjoying all the chatter and laughter, all those caresses that soothed and tickled him everywhere; all that company he had missed so badly yesterday, during his quest for the thickplant.

Surrounded by their excited people, Galem and Kala walked toward the sick child's cave. Kala was holding the branches of thickplant. On their way, they all made a wide detour to pass as far away as possible from the ominous mouth of the firecave, dark in daytime, glowing red after sundown.

Galem left the mortar on the ground by the child's bedside and fetched the branches of thickplant that Kala proffered him. Then he placed all the leaves into the mortar, crouched by it, and started to shred the leaves with the aid of the round pebble. He prayed to God that the thickplant would work this time also. Like all discoverers, Galem was in fear that his brainchild would not rise to his expectations and fail to work this time.

He stared at the child as he worked. His dry mouth was open and his eyes were sunken and lifeless. All his body seemed to have shrunken. The child's father and pregnant mother were by his bedside watching Galem intently, as the villagers stood outside the cave; and in the expectant silence the shallow, gurgling breathing of the sick child could be clearly heard by all of them.

After he finished with the mortar, Galem fetched a spoonleaf the woman had ready, his hand dripping red with the fluid. Galem placed a spoonful of the potion into the child's mouth, but most of it spilled along his cheeks. Galem stared at the child, the empty spoonleaf poised. After a long moment the child swallowed weakly. Galem gave him another spoonful. This one didn't spill; the child swallowed sooner, and then took another and another. The child swallowed more and more vigorously, his breathing became stronger, and he seemed to fill up all over. His eyes started to sparkle. The air suddenly became filled with hisses and moans, and the child's parents and all the villagers started to rock. When the child sat up and said that he was hungry, his father, moaning and rocking, ran out in search of foodplants, and was caressed by the crowd outside on his way to the river. Galem stood up slowly and closed his eyes to thank God for His mercy, lost in the poignant and peaceful elation that is only felt when a life is jerked free from the claws of Death. When he opened his eyes again, the child was eating greedily. Galem started to moan and to rock.

Then he went back to the Temple of Wisdom. Everybody around him was chatting, hissing, laughing and caressing him; but Galem was silent. His joy was so intense and so profound, as was his sense of triumph, that he had no way to demonstrate it.

He entered the Temple alone and walked toward the large red altar. His father was contemplating a large red triangle that had been drawn, nobody knew when, in the wall behind the altar. Galem replaced the mortar by the altar's side and then stood watching his stooping and enfeebled father, whom he loved and revered so much.

"What do you see in that triangle, Father?" he asked after a moment.

"I see love, my son," replied his father, still looking at the drawing. He

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slowly pointed at the three angles with an index finger that shook slightly with age. "When two love each other, they love God, and God loves them." Then he looked at Galem, who noticed with concern that his eyes were dull instead of sparkling. He seemed to have aged a lot since he had last seen him, a fact that saddened and worried Galem. His father went on, "You were a very brave man, my son, to venture alone so far away to help that child."

Galem opened his mouth in surprise, for he saw nothing special in what he had done. A life had to be saved, and that was all there was to it. But then, his father was congratulating him and he had to answer.

"Thank you, Father," he answered, bowing deeply. Then he walked toward a painting in one of the lateral walls. It was a sequence that showed first a woman burying her egg in the sand under a blue sky. This painting was repeated three times. In the fourth a woman, under a grey sky, was carrying her egg to the firecave. Galem pointed at the sequence, and also to other paintings that depicted a grey sky, and some of them also a white ground; and said, addressing his father, "Father, I would like to ask you something that disturbs me greatly. The day before yesterday was grey in the morning, and everybody was sleepy. Do these drawings here mean that there will come a time when we will sleep for a long time?"

His father looked at him for a long time before answering. Then he said, "My son, I will tell you a secret, because soon you will become the new priest." He lifted his hand to quell Galem's shocked answer. Then he went on, "People think of it as a legend because my father, and his father before him, made them believe so; but it is true. When my grandfather and all who had hatched with him in the firecave had to leave, after the glowing food had turned sour, they found the remains of their ancestors here, in the Temple of Wisdom, all huddled around the altar. The fourth woman in that sequence is taking her egg to the firecave, instead of burying it in the sand. Four women mean four generations. And you are fourth generation, my son. You will have to lead the women to the firecave and then minister to all the villagers here in the Temple to the end. That is the Law and you will be its priest."

"But I have made Kala pregnant!" answered Galem, horrified.

"Then you will have to lead her to the firecave with the rest of the women, if she delivers when the skies become grey."

Galem hung his head in despair. Then he asked his father in a dull voice, still looking down, "Father, what will happen to my discovery? How many children will have to die because they don't know about thickplant?"

"Draw about your discovery in the walls, my son. I was able to learn the meaning of the triangle. Trust your descendants as our forefathers trusted us."

Galem stared at his father and then at the ceiling of the Temple, shaking with impotent fury. "But what is the point?" he yelled. His voice echoed hollowly all around him. "What is the point in our living, and loving, and learning? What will become of my son? Why can't we survive?" He lowered his

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head, and started to moan and to rock. "Why does God have to be so unfair?"

His father walked toward him and placed a hand on his shoulder. He said softly, "There is no reason, my son; and God is not unfair. He had reasons we cannot understand. Soon you'll be your people's priest, and you won't be able to shepherd them to the end if you think that way. Be humble, my son, and accept the will of God."

People started to enter the Temple, and Galem's father climbed atop the altar with difficulty to conduct the evening services. Galem remained with a heavy heart, angry and confused. And also horrified, for he feared the ordeal he would have to undergo after his father's death. What kind of a priest would he make for his people in the critical times ahead, with all his doubts and misgivings?

After evening services, Galem's father went to the river, wetted his fingers, and returned to the Temple, where he solemnly anointed his son as a priest with water. Then he lay on the floor and died shortly thereafter.

Galem was overcome by grief, as everybody moaned and rocked around him. And he was also overcome with fear, for when a priest died, his successor had to take his remains to the firecave and drop them into the fire, instead of taking them to the river as they did with everybody else's. And Galem didn't know whether he could summon enough courage to go through such an ordeal. But he had to do it. The ceremony was clearly drawn in one of the walls of the Temple of Wisdom.

Galem took his father in his arms and slowly walked out of the Temple, followed by the villagers. Then they all went toward the firecave. After a point, where the villagers stopped, Galem had to proceed alone. The sun was already setting and, in the twilight, Galem saw the mouth of the firecave glowing red as he approached. His knees almost gave way, but somehow he managed to control his fear enough to keep on walking.

His heart was thumping madly as he entered the cave. The warm air inside reeked with the nauseating stench of the glowing food that grew all over an adjoining spacious cave. A long way ahead was a solid wall of fire that reflected in the glazed walls, and in the large red egg altar that stood halfway between Galem and the wall of flames. The cave was immense. As Galem walked, he became horrified when he noticed that he and his father were being suffused with the same live, flickering hue that tinged all his surroundings. The roar, almost imperceptible by the egg altar, rose in pitch until it became deafening by the time Galem reached the end of the floor.

Ahead was a chasm. Farther still, nothing but fire as far as his glazed eyes could see. The heat was unbearable. Galem let his arms drop and slowly turned around. His pent-up panic soon burst forth, and Galem started to run and to scream as one possessed; he dropped in a dead faint when he reached the villagers who were anxiously awaiting him outside.

He was carried to the Temple of Wisdom and, despite Kala's tender ministrations, he was unconcious and raving for three days and three nights. Afterward he recovered, but from then on he

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couldn't think of the firecave without being overpowered by an irrational fear. Kala left him and went to her cave as soon as Galem was well, for only the priest could dwell in the Temple of Wisdom.

Galem spent the next few days painting about thickplant and withering disease in one of the walls of the Temple as clearly as he could. He then called in villagers, young and old, to see whether they understood his sequence of paintings or not. Although all seemed to understand, Galem was still haunted by the presentiment that their descendants wouldn't, and that his life-saving discovery would die with him, after the skies became grey and the ground white.

Galem spent a long time studying the drawings of the Temple in an attempt to find a clue about the mysterious sleep of death. After all, he had been able to control withering disease, and this grey-sky-and-white-ground disease couldn't be that much more difficult to control. But days passed by and nothing occurred to him. He became more and more impatient and angry, and also more remorseful for not being a good priest to his people. Aside from studying the drawings and thinking, Galem had a lot of work presiding over morning and evening services, visiting the caves of the villagers, helping the woman to bury their eggs and then to receive their babies in the Temple, and taking the remains of the dead to the river. He did little or no counseling, though, because his people were happy and carefree. But all in all he was so busy that he could hardly find the time to spend a moment in Kala's cave.

Galem awoke one day feeling drowsy. Somehow he knew it was late and walked to the entrance of the Temple. The sky was grey and the wind was howling. The villagers were coming to the Temple. They looked dejected and afraid. They didn't chat or laugh, and only exchanged an occasional forlorn caress. They all became wide awake at the service, praying to God to bring back the blue skies again. But the sky remained grey and the wind went on howling after the service, despite the fact that Galem had made his sermon last much longer than usual.

There was a low murmur as Galem stepped down from the altar. The villagers looked at each other, and many averted their eyes. The eldest walked up to Galem and said, "Why have our prayers failed this time? Not so long ago, when your father was still priest, we prayed and the gray went away and the sky was blue again."

Murmurs started again as the people looked approvingly at the eldest who had spoken. Galem stood paralyzed. Well he knew he hadn't been a good priest, with his lack of faith and his rebelliousness at God's Law. Perhaps that was why the prayers had failed this time.

Kala walked forward, her belly bulging with life, and knelt in front of her husband. She said in a loud and clear voice, "We love you and we trust you!"

The murmuring stopped immediately and a few hisses were heard here and there, but the congregation still avoided looking Galem in the face.

The sullen silence was broken by Kala. She started to moan softly, obviously about to give birth. Galem as-

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sisted her. The delivery was easy, and soon Kala had her egg in her arms.

"Will you help me bury it in the sand?" she asked her husband, her voice quivering a little after the effort.

Galem stared at her for a moment. Then he walked to one of the lateral walls, and pointed at the drawing that depicted a woman carrying her egg to the firecave.

"You can't bury it in the sand, Kala," he said softly. "You will have to take it to the firecave. The sky is grey."

There was a horrified uproar as every mother asked if she had to unbury her egg and take it also to the firecave. Galem lifted his hand to quiet them. Then he said, "You will all have to take your eggs to the firecave. It is the Law and we must obey it. I will help you to unbury them and I will lead you to the firecave. Kala, you remain here and join us when we are ready."

The women were moaning and rocking as they followed Galem out of the Temple of Wisdom. The men stood rooted, too terrified to help or to vent their feelings.

The wind outside soon numbed Galem's skin and made his movements sluggish. He managed to remain active by vigorously helping the women to unbury their eggs. He and the women were starting to feel sleepy as they worked.

One of the women cried out loud, for her son had been born. She was the mother of the child Galem had recently saved from withering disease. Galem was immediately by her side. The baby's movements were unusually slow. Galem asked her to return to the Temple with her baby.

The women finished unburying their eggs in silence. They were too sleepy and too frightened for emotional demonstrations at a child's birth. Kala joined them and all went to the firecave.

But Galem, try as he might, couldn't bring himself even to get close to that dreadful cave again, so he directed the women to stack their eggs around the egg altar. Galem ran around to remain awake while awaiting the women.

Sleet started to fall when they were halfway back to the Temple of Wisdom. By the time they all reached it, Galem had lost all feeling in his arms and legs, and only wanted to lie down and sleep. He walked around, directing his people to remain together, and then sat by Kala. All were asleep by then. Galem remained awake, thinking about how to save his people from this new disease, but soon he was asleep, too.

Galem dreamt that Kala was calling him. He managed to recall that she had recently delivered and woke up with a start. He looked around, his eyes leaden with sleep. Kala was sleeping by his side, and her breathing was shallow. Galem was about to fall asleep again when a woman's voice called him. Galem stood up slowly, looking around. The eyes of several adolescents and young adults half-opened as he stood, to close again. The voice called Galem once more. It was the mother who had delivered before he had led the women into the firecave. Galem walked to her. The Temple was so dark that Galem thought it was either early dawn or late evening. The wind had stopped howling. The breathing of the elderly had

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stopped completely, and that of the others was very shallow in their sleep. Galem's mind, formerly so nimble, was now slow and uncoordinated. Unhinged shadows of thoughts drifted confusedly in and out his conciousness as he fought his sleep away.

"My baby is sick," murmured the woman when Galem reached her. "Can't you cure him with thickplant?"

The woman was fast asleep as soon as she finished talking. Galem stood up, swaying slightly. He would have given anything to lie down again and to go to sleep. But his mind was working, however sluggishly. Thickplant could be the answer! He had to go out and get it.

Galem walked out of the Temple and toward the river. The sky was very grey, almost dark, and the white carpet on the ground was thick enough for his feet to sink in it. The air was so sharp that it shocked him every time he breathed. Galem stopped suddenly in his tracks after a few steps. There was no river in sight! Nothing but the white carpet as far as he could see, covering the mountains and forming little mounds all around him.

Galem turned around to orient himself, but he reeled and fell on the white carpet. His need of sleep became overpowering, but equally overpowering now was his need to find a cure for the people he loved so much. It took him some time to fight his sleep away and to slowly, very slowly, stand up again. Again he looked around, but his eyes weren't working properly. All he could see was a dark grey void. *Am I going blind?* The thought horrified him. Terrified, Galem squinted in a futile attempt to focus. Suddenly he saw a red blur in front of him, then two that started to dance, then one again. Galem rubbed his eyes roughly with hands that were too numb to feel, as his overwrought mind began to hallucinate. He saw clearly in front of him the red bush of thickplant surrounded by foodplant, the flowing river at his left. He didn't remember having walked that far; his consciousness didn't seem to register the fact. The bush was tantalizingly close, so much so that Galem extended his arms forward as he concentrated what remained of his willpower to move first one benumbed foot toward the red bush and then the other.

The Gods landed some distance away from the little village, as they did at the onset of every spring and of every winter. Clad in their spacesuits, they observed from afar. The Son God was now a handsome adolescent almost as tall as his father.

The Goddess Mother glanced sadly around. She looked at the empty dwelling caves, at the glowing mouth of the hatching cave, at the silent Temple, at the pathetic dams over the rill that, like all the others built before it, would be washed downstream by the furious waters of spring after the thaw; and the heavily overcast sky intensified her melancholy.

All three heard again the subdued prayers at noontime, and afterward the shouts of pain and fear, the females and the male unburying the eggs, their procession to the hatching cave, and their return to the Temple under the sleet.

Then came again the first snowfall. The Gods remained until it ended, hoping against all hope, since that snowfall

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had always meant the end of a cycle; but this time their hope was rewarded.

With bated breath, they watched a male creature come out of the Temple, walk for a moment and then fall on the snow. The Father God sternly held his son's arm; the younger had been about to rush forward to help.

Then they saw the creature stand up again and, walking and afterward crawling, always groping ahead, advance toward the mouth of the hatching cave that glowed red in the twilight; to finally enter it.

His entrance was followed by another snowstorm. The wind started to whirl the heavy snowflakes viciously around. This storm would obliterate the Temple and the mouth of the cave until next spring.

But now the Gods were happy and well pleased as they returned to their ship under the snowfall.

Then they left that planet and its system, to disappear into the space-time warp.

Perhaps they would return to see how things were coming along some day, though that day would certainly not be the beginning of next spring. For the Gods now knew that they were needed in that planet no longer. ■

ON GAMING

(Continued from page 77)

monsters or running from them, and taking the treasure, if any. The computer screen shows this action, and also gives a running account of slain monsters and your character's current fatigue and wound status.

The following four games were designed by Chaosium Inc. (Box 6302, Albany, CA 94706).

Lords of the Middle Sea, a board game for two to four players, hypothesizes catastrophic climate changes and destructive volcanic activity in the 21st century and a nuclear war that wipes out most central governments. After several hundred years most of North America is under water, and the players represent the four feudalistic nations surrounding the Middle Sea. The object is to enlarge your area of control through alliances and combat.

Game components include a color map showing a faint outline of 20th-century land masses and borders, along with the actual world in 2401 AD: farm areas, cities, mountains, and clear terrain; and 252 die-cut counters representing armies, emissaries, arks and sea raiders, dirigibles, etc.

Stormbringer is a fantasy role-playing game based on the World of Elric, as created by Michael Moorcock in his novels. Players are warriors, priests, nobles, merchants, etc., working their way through the Young Kingdoms for fame, wealth, and magic. In general, the Elric stories have an atmosphere of gloom uncommon in heroic fantasy. The players, however, can be quite successful in their adventures even if the saga is, like much Scandinavian mythology, one of eventual doom.

The game includes a 144-page book with background, rules, notes on characters and beasts, and a sample adventure. *(continued on page 113)*

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the reference library

By Tom Easton

Earth Is Heaven, E.C. Tubb, DAW, $2.25, 160 pp.
Moonbog, R. Hautala, Zebra, $2.95, 410 pp.
The Queen of the Legion, J. Williamson, Timescape, $2.95, ? pp.
Port Eternity, C.J. Cherryh, DAW, $2.50, 191 pp.
Home—To Avalon, A.H. Landis, DAW, $2.50, 223 pp.
A World Called Camelot, A.H. Landis, DAW, $2.35, 220 pp.
Alpha Centauri, R. Siegel, Berkley, $3.95, 225 pp.
Darkchild, S.J. Van Scyoc, Berkley, $4.95, 249 pp.
The Umbral Anthology of Science Fiction Poetry, S.R. Tem, ed., Umbral Press, $4.50, 226 + xiv pp.
Isaac Asimov, J. Gunn, Oxford University Press, $18.95 cloth, $6.95 paper, 236 pp.
Genetic Alchemy, S. Krimsky, MIT Press, $24.95, 445 pp.
Mission to Mars, J. Oberg, Stackpole Books, $14.95, 224 pp.

I have something of a hodgepodge for you this month, dear readers. There's a miscellany of novels, one quite good but none marvelous, a nice book of poetry, one of criticism, and two of science. Which is best depends on your tastes.

The first novel is E. C. Tubb's **Earth Is Heaven,** #27 in the endless tale of Earl Dumarest's search for Earth. Tubb has been setting us up lately, telling us how close Dumarest was. We've been looking forward to the end. But it is not to be. Dumarest has his ship, he has Earth's supposed coordinates, and he has a crew. He surmounts various problems—a dead engineer, sabotaged air plant, missing funds for repairs—by falling in with a pair of plots: one of peons to escape, the other an ambitious outsider's to remove a threat to his elevation by marriage by killing Dumarest. He takes the peons to the world of

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his coordinates: a world of ruins populated by angels and demons, the females and males of a genetically engineered race of humans. A neat idea, that—if angels and demons were real, they could indeed be the two sexes of a single breed. It even makes sense in terms of history and myth. In one tale the male gods supplanted the Earth Mother. In a second tale, told by the male gods' devotees, the Earth Mother's female minions cast out the others as demons. There's a pleasing symmetry, a justice, there.

Dumarest is trapped when the Cyclan, that horde of surgically robotized Machiavellis, arrives. Yet he fends them off and escapes once more. And now Tubb lets us have it—Dumarest is *not* on Earth after all! The moon and sky are wrong. All his search to date has been fruitless. All his apparent progress futile. He has it all to do over again. The tale will go on, and on.

How does the reader react? There's a certain wry appreciation for being had well. But that doesn't last nearly as long as my irritated, impatient, "Oh, no! There's more!" Yet the series sells—so many people seem to love reliable repetition. Perhaps we should call the Dumarest saga the soap opera of science fiction and be done with it.

Think of a magician. The secret of his success is distraction. While his right hand plucks the dove from a concealed pocket, his left waves a silken kerchief, or points at his sexy assistant, or juggles a pair of glinting rings. But the key is distraction. He would succeed as well or better if he—or his assistant—geeked a rat.

Yukkh! you say. Yeah! Magicians don't do things like that! They wouldn't dare! But writers do. I even have an example—**Moonbog,** by another Maine writer, Rick Hautala. He sent me a copy after we met at a local party. Wanted to know what I thought, you know? And I told him.

Zebra bills the book as horror, but it's more suspense of the "gross-'em-out" school. In a small Maine town, 12-year-old boys are disappearing. David Logan, returning from New York City to his childhood turf with his girlfriend, Allison, arrives in time to spot the latest victim being dragged into the bog. He stops, scares off the monster, and discovers the horribly mutilated body.

The gross-out comes first, though, in a graphic scene of murder. An even grosser scene comes later, when we see simultaneous murder and pederasty. Yet for all the repulsiveness, I did keep reading. Rick manages his suspense well, if heavy-handedly and, for as long as he intended, I suspected David's uncle. If my suspicions began to wander, he geeked another rat.

If you can stand—or like—the graphic violence, you'll enjoy the book. Rick has talent. The single worst flaw in the book, in fact, is a scene added at his editor's insistence: late in the story, Allison gets fed up and heads back to New York. Rick wanted her simply to leave. Prodded, he made her another victim in a way that made me expect him next to put David in an awful jam with circumstantial evidence. When he didn't, I felt misled. (Other editorial interventions, confessed to by the author, work better.)

After reading the book, I wrote Rick to tell him my reactions. Oddly, he liked the "geeking rats" line and said he didn't mind the zinger at his expense. Anything for publicity! He then sent me his first novel, *Moondeath,* also from Zebra, saying, "This one geeks a lot of rats!" I haven't found the time yet to read it, but I will tell you now that it's

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a werewolf tale. You can guess whether you're likely to enjoy it.

Rick's third novel (working title: *The Menhir*) is in his typewriter now. He says it too is horrifying, but without the grossness. "Just good clean fun."

Jack Williamson has added one more to his "Legion of Space" trilogy: **The Queen of the Legion.** He needn't have bothered. His effort is trite and superficial. It satisfies no sense of wonder, suspends no disbelief. His characters seem little better than puppets on a stage. He has done much better.

What's the problem? In part, I'm sure, it's the way the story reached me. Someone apparently dropped the manuscript on the way to the typesetter, and in the bound galleys I had to unravel scene after scene was out of place, just as if someone had shuffled pages. I pray to ghod someone fixes the problem before publication.

The story begins with a child, Jill Gyrel, who wants to join the Legion when she grows up. But the Legion is in trouble. The folks back home don't believe the Legion ever really saved the universe. They're cutting funds, drying up support, egged on by pacifists.

Jill's daddy disappears on a mission into the mysterious Nebula. His partner eventually returns, strangely changed, to marry her mother. Both join the peaceniks and embezzle Jill's inheritance. Jill flees home, then heads for space to join the Legion. But the Legion is accepting no recruits, and the Keeper of the Peace, who guards the Legion's ultimate weapon, has just been assassinated. Jill takes off on her own search for destiny, aided by coincidence and the immortal Giles Habibula. She finds the threat—parasitic aliens are taking over human minds and using their hosts to disarm all opposition. She finds her daddy and loses him. She learns the secret of the Nebula. She saves humanity, and she becomes the new Keeper of the Peace, the Queen of the Legion.

It's classic stuff, yes. It would have gone down well once upon a time. But Golden Age gold is a gold that tarnishes. SF has matured. So has Williamson, who should know better than to repeat himself.

C. J. Cherryh has tried something interesting, but only partially successful, in **Port Eternity.** In the universe of *Downbelow Station* and other novels lives a wealthy woman, one Lady Dela Kirn. She has a fancily decorated starship, the *Maid of Avalon*, staffed with "made people," clones programmed for their duties. She has given them names from Arthurian legend: Lancelot, Percivale, Gawain, Modred, Lynette, and Vivien. Her maid, Elaine, is the narrator. At the start, that is as far as the Arthurian parallel goes. But Elaine has borrowed her mistress's taped dramatization of an Arthurian poem. She knows what her name means and the role she stands for. Her fellows are still ignorant.

And then the ship falls into a strange, inescapable place beyond normal space. It docks with a mysterious object that may be a station, for it is festooned with alien ships. Noises assault the hull. Her fellows experience the tape, and conflicts of role, of dream and reality, emerge. In the end, the tape-defined roles help their adaptation to the future.

Strange setting and event interfere here more than they should with what seems clearly meant as a novel of character. (Or is it an allegory of fandom?) The problem, I think, is that the characters do not live as they do in other Cherryh novels. They lack vitality, urgency, motivation. Their pasts are too

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skimpy, their programming too dominant, at least at first. They are machines (archetypes) groping for life in a way we lack the experience to understand.

If this view is Cherryh's intent, she succeeded. However, I—and presumably you—am not enchanted by tales that, intentionally or not, leave me dissatisfied, groping in a fog of uncertainty or irresolution. As an allegory—and I hesitate to come right out and call it one—it would please me better.

Arthur H. Landis comes to us from DAW with a fistful of novels. First is **Home—To Avalon.** Next is the Camelot trilogy, beginning with **A World Called Camelot.** As you might guess from the titles, they're science fantasy, gleaming with castles, knights, and magic. *Avalon* comes closer to true SF (it offers less magic). Two millennia after Earth's destruction, humanity survives on a hundred barren worlds in the small descendants of mining colonies, constantly at war with each other, constantly yearning for the inaccessible — Avalon, the one Earth-like world ever discovered. There are people on Avalon, also descended from a colony, but there is also a shield that permits no ftl ships or messages to approach closer than 20 light years. Hence, out of jealousy, the non-Avalonians have sent a sub-light planetbuster. If they can't have Avalon, no one will.

Come story time—the missile is only months away. A ship arrives at Drusus Colony, invites Warlord Jarn Tybalt aboard, and flies him to Avalon, there to save the world in the face of local war, dwarves, orcs, and ghosts. He succeeds, and he wins a queen to boot.

In *World,* we have Fregis, called Camelot, populated by human-like aliens at war with a mysterious evil which, for its own purposes, has made magic possible worldwide. Humans have sent an Adjuster to study and influence, but he falls for the princess and is soon busy saving the day. Nice wish-fulfillment fantasy.

But I don't recommend either *World* or *Avalon.* In *World* we see such butcheries of language as "My eyelids focused purple contact lenses to six magnitudes" (p. 6) and "at a distance of two degrees, but within the same parallax" (p. 31). We wince at such egregious dumbness as saying a six-legged beast has six pairs of legs. And so on. I could point out similar blunders in *Avalon*; instead, I'll merely object to colonies that survive 2,000 years without adapting to their situations or displaying the consequences of genetics for small populations. As Landis describes them, his colonists might be no more than a day—or a year—from Earth. Their attitudes, psychologies, societies, all are unripe, immature, lacking all signs of a history of their own.

Now, how else can I dump on Landis? I still haven't mentioned that his plotting and action are tritely derivative, clichéd, hackneyed—but perhaps you've already gathered that.

Poet Robert Siegel offers us **Alpha Centauri,** a ridiculous fable that seems best suited to 10-year-old minds. They might get off on it. Adults won't.

An American girl, Becky, is in England with her father. They visit an old friend in Surrey. There she meets Rebecca, a horse, who one night awakens her and takes her for a ride into a thick fog and an earlier age of the world. She meets the Centaurs, threatened by men, whom they call the Rock Movers, and accepts a mission to the First Ones. On the way, she is kidnapped by the Rock Movers and taken to their city. Faced with marriage to an Atlantean lord, she

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escapes and returns to her mission. Thanks to the delay, it now emerges, she has only three days to lead the Centaurs to a standing stone and use her mystic powers to open the gate to Alpha Centauri, the worldly heaven of the Centaurs. She succeeds, and Rebecca returns her to her bed, only moments after her awakening. Yet it has not all been a dream, for Becky still has a token, a sapphire on a chain.

You *can* do better for your 10-year-old friends.

Much better—as you'd expect—is Sydney Van Scyoc's **Darkchild.** The story is set on a world of ice and mountains. There, long ago, humans crashed and colonized, surviving, and finally thriving as they adapted. They found a way to sleep the long winters through. A breed of women arose who could capture and focus the sun within their bodies and use it to bring early spring. Yet these Barohnas attain their powers only in puberty, after killing a fearsome mountain beast. Most fail in the test.

Khira is a Barohna's daughter. She has lost all her sisters in their tests. Her own is ahead, and to survive it, she knows, she must learn to put stone in her heart. She feels doomed that winter when—her mother in the peaks collecting sun, she alone in the palace, awake as only Barohnas and their children can be—a waif appears. A child, speechless, curious, endearing, infuriating — Darkchild, she calls him, and she teaches him speech, reading, custom, and all the rest of her world. Come spring, she learns her Darkchild is the illegal clone of a long-gone explorer, exploited by the Benderzic. They plant their children on new worlds to absorb information as only children can. They program their minds with a "guide" to keep them safe and on the track. When their minds are full, the Benderzic retrieve them, pump them dry, wipe them, and plant them again, elsewhere. The information the Benderzic sell to the highest bidders: pillagers, exploiters, slavers; world-rapers all.

Who tells Khira and her mother all this? The Arnimi, another race of information-collectors, albeit ones with more scholarly aims. What will Khira and her mother do to protect their world? Kill Darkchild? No, for he is no machine, and he hates his own exploitation. Keep him from the Benderzic? Impossible.

The key lies in Khira's nearness to puberty and her impending trial at metamorphosis. I won't say more except to say that though the end seems pat, it also is satisfyingly just. The story's greatest flaw lies in the marvel of the Barohnas. Van Scyoc credits their powers to biology, but I don't believe it for a moment. The notion is too magical, and it fails to mesh with the rest of her universe here, a coldly believable interstellar society.

The National Endowment for the Arts does some nice things, even in our bailiwick. It helped Steve Rasnic Tem publish his **Umbral Anthology of Science Fiction Poetry** (from Umbral Press, 2330 Irving St., Denver, CO 80211). According to Tem, it's the only book of SF poetry currently in print, but that is not its only claim on our attention—it's good. Tem has sieved the past decade for his material as well as found some new poems. He has arranged what he found by poet rather than theme, though, so the book has no flow.

He gives us D. M. Thomas (with the excellent "Missionary"), Sonya Dorman, Tom Disch, Brian Aldiss, Ray Bradbury, James L. White, Marge Piercy, Michael Bishop, Bruce Mc-

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Allister, Gregory Benford, Dane Ackerson, Gene van Troyer, Robert Frazier, Tem himself, David Bunch, Archibald MacLeish, and many more. He adds an introduction and an afterword, discussing the natures of SF and speculative poetry. If you have any taste for poetry in general or SF poetry in particular, you will order this book. You will not be disappointed. Just don't forget to add $.75 to the $4.50 cover price for postage and handling when you order.

Oxford University Press's series on SF authors began with volumes on Heinlein and Wells. I reviewed them here. How, then, can I not cover James Gunn's **Isaac Asimov: The Foundations of Science Fiction**? I should not let the Ungar volume of three months ago inhibit me, especially since Gunn does a better job, perhaps because he knows both field and man better than Fiedler and Mele.

Gunn covers all of Asimov's science fiction, stopping short only of the latest, *Foundation's Edge*. He considers too the whole man, Asimov as mystery writer and science popularizer, and in the process he goes a long way toward explaining why Asimov occupies the position he does in the world of SF: he defines it, largely because of his devotion to rationality.

Science belongs in *Analog* and in "The Reference Library," but what topics and at what level? Should Stan and I ignore anything that is not a popularization? Anything that deals not with space, technology, and the future? If you think so, you can stop reading right here, for I am about to tell you about an *academic* book, **Genetic Alchemy: The Social History of the Recombinant DNA Controversy.** I justify it by saying the book illuminates the scientific and regulatory processes and the politics of science, and recombinant DNA will have as much to do with the future as any other field of science or technology. Its threat and promise are every bit as great as those of rocketry, or the split atom, or—you name it.

One of the book's more interesting theses is that the response of scientists to the emerging recombinant DNA techniques was conditioned by the social activism of the 1960s. Responsible people were *supposed* to holler about racism, sexism, unjust war, and so on. The idea doesn't surprise us, for most of us, I'm sure, feel that by the 1960s it was high time that that idea became respectable. A social conscience is useless if it resides in the voices of a mere handful of academic kooks. It needs a broad base.

Much of the book's value lies in its reliance on the "oral history" archives maintained at MIT. Here are preserved interviews with key figures in the recombinant DNA debate, giving details, views, attitudes that have not been given wide play. The book thus offers us something of an inside view, as perceived by a Tufts Professor of Urban and Environmental Policy who served on Cambridge's Experimentation Review Board, which arose from public paranoia over the hazards of recombinant DNA research. Krimsky apparently learned a great deal while on the board and emerged more critical of scientists as policy-makers than afraid of the new technology. Yet he remains watchful.

Jim Oberg's **Mission to Mars** convincingly demonstrates that we could reach the Red Planet by the year 2000 at a cost comparable to the Apollo program. We could even begin settling our first alien world. The hardware is now

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available or within easy reach, and all we need is the national enthusiasm that gave us—for a while—the moon.

The Russians apparently are already on the way. Their space program is methodically deploying all the necessary components, and their people are making confident predictions, though not loudly, perhaps for fear of goosing the U.S. into another space race.

Why should we go? To beat the Reds? Manifest Destiny? If that's what it takes to get the national ass in gear, fine. But there are countless scientific benefits as well, including some back-home applications in meteorology and climatology.

The book surveys a large number of studies from NASA, the aerospace industry, and the "Mars Underground." Oberg refers repeatedly to the April 30-May 2, 1981, "Case for Mars" colloquium held at the University of Colorado, Boulder. He leaves out many details, as he must in a book of this length, but he provides his sources.

Thanks to the overview approach, the tone is more than a little breathless. This irritates at times, as do the occasionally poor copyediting and clumsy language. But gosh! Gee, whiz! We could do it!

Will we?

Send copies to your "representatives" in Congress. At least, write them letters. ■

ON GAMING

(continued from page 106)

Thieves' World is based on the popular anthologies *Thieves' World* and *Tales from the Vulgar Unicorn* by Robert Asprin. Twenty-one people contributed to its design, including Poul Anderson and Asprin. It's a fantasy adventure pack for use with *nine* different role-playing systems: D&D®, AD&D®, Traveller®, RuneQuest, Tunnels & Trolls, The Fantasy Trip, Chivalry & Sorcery, DragonQuest, and *Adventures in Fantasy*.

The pack comes with three reference maps—a large one of the city of Sanctuary and two smaller ones of the maze area above and below the Vulgar Unicorn inn ("Only those who seek Death or sell It enter the Maze").

Call of Cthulhu (kuh·thool'hoo), set in the 1920s, is a role-playing game based on the gothic horror worlds of H.P. Lovecraft. Players are adult Americans of the period with nine dice-generated attributes: strength, constitution, size, intelligence, power, dexterity, charisma, education, and sanity.

Since a character is not a magician or powerful barbarian, nor a laser rifle-equipped space marine, these average characters have a high mortality rate. Investigating (or stumbling upon) the evil Cthulhu cults and trying to destroy them are your goals as an intrepid adventurer. ■

OLTION'S COMPLETE, UNABRIDGED
HISTORY OF THE UNIVERSE

Bang! . . . crumple.

Jerry Oltion

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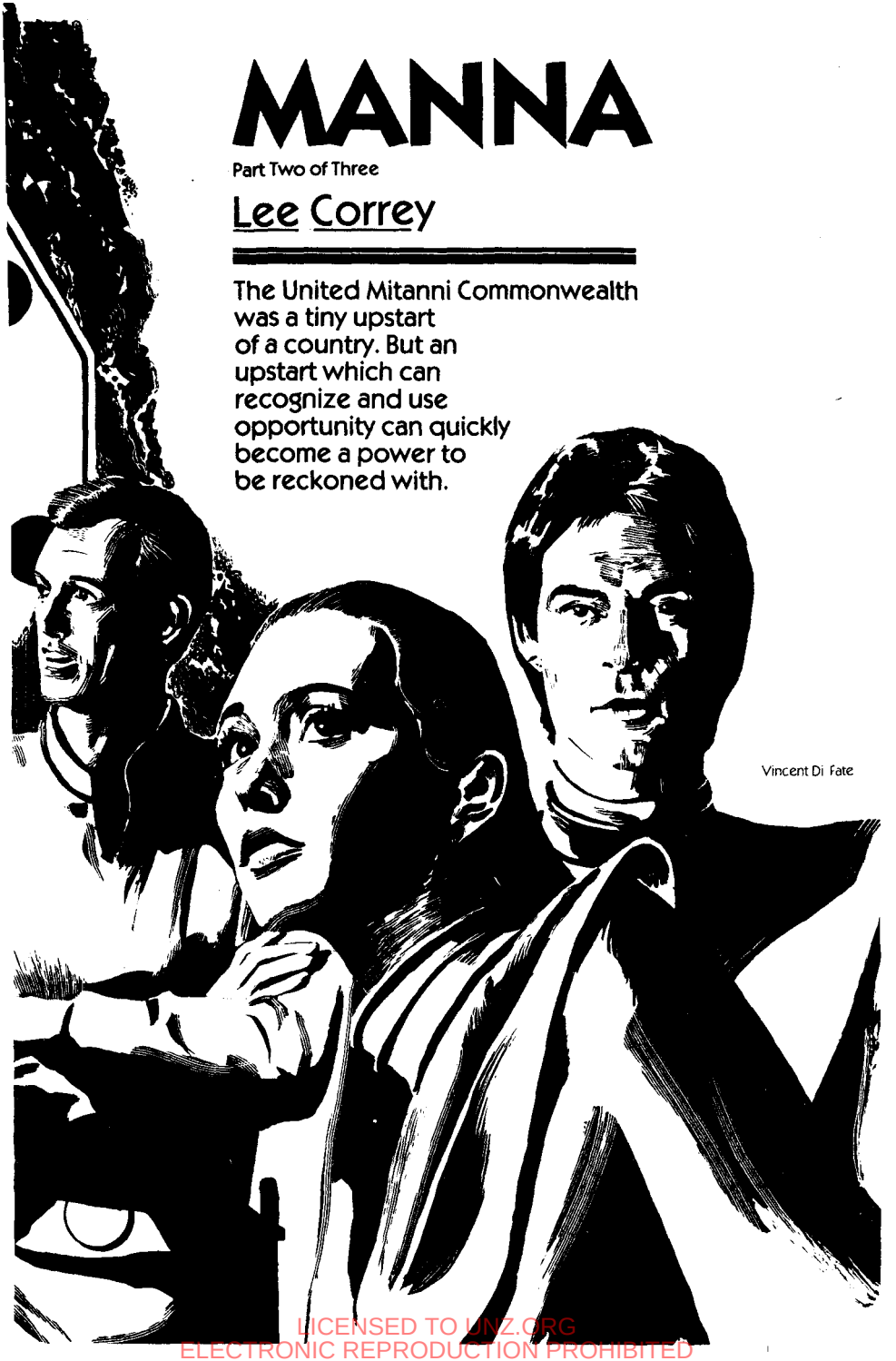
MANNA

Part Two of Three

Lee Correy

The United Mitanni Commonwealth was a tiny upstart of a country. But an upstart which can recognize and use opportunity can quickly become a power to be reckoned with.



Vincent Di Fate

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SYNOPSIS

I'm **Alexander Sandhurst Baldwin,** *but please call me* **Sandy.** *After the United States Aerospace Force cashiered me, an Academy graduate, because I ignored policy and shot down a Soviet space fighter to save myself, I answered an ad for an aerospace pilot and found myself in the United Mitanni Commonwealth on January 1, 2050, as they were celebrating fifty years of nationhood. I happened to be in the right place at the right time to prevent the assassination of* **Vaivan Vamoru Teaq, Alichin Nogal Vamori,** *and* **Omer Kolil Astrabadi,** *"The Mad Russian Space Jockey." Since they had placed the advert, I found myself accepted into their circle in the strange free-market culture of the Commonwealth, which had been founded by Ali's grandfather,* **General Anegam Dati Vamori,** *otherwise known simply as "The General." In a teleconference I learned more about the inner workings of this successful free-enterprise culture, which was based on The General's "abundancy economics," a philosophy directly opposed to that of the world of scarcity and limits which had predominated for centuries. These people believed their adversaries were not other nations, but multinational power groups.*

But I got the feeling that a few of them—financial experts and bankers like **Heinrich von Undine, Kariander Dok,** *and* **Tonol Kokat**—*were still primarily interested in the age-old goals of money and power.*

Terrorist assassination attempts continued, one of which I foiled. Terrorist arson caught all of us in Karederu Center, and The General was badly burned. **Dr. Tsaya Chiulia Stoak,** *an attractive but quiet young woman, insisted on rehabilitating The General in the hospital facilities of the L-5 space complex, so Omer and I, ferrying Ali, Tsaya, and The General, made an emergency flight there.*

Although I'd seemingly been fully accepted by these people, I really didn't understand what role I could play in their complex affairs. I didn't even understand the Commonwealth and all its unusual cultural quirks. It was a low-tech country in the mid-21st century, yet these people acted as if they were playing in the main tent. But I admired them for refusing to knuckle under to pressure of any sort from high-tech world powers. Although I was only beginning to grasp their military posture, Vaivan and Ali handed me the job of their deputy military advisor. This dumped me right in the middle of a very complex system and gave me enormous responsibilities to counter serious threats that could destroy everything these people had worked so hard for. But the most serious problem facing me was the military one; I had to manage to stop Space War Two before it got started.

•

To me, a machine was something to be mistrusted, checked before use, and operated within the limits set forth in a manual. Omer Astrabadi, the Mad Russian Space Jockey, lived up to his sobriquet. He approached machinery differently. I never saw him run a preflight inspection; he strapped into the seat, powered up, and went. I never saw him consult an operating manual. But he knew the limits of the machine. He

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wasn't gentle with it, either. If it didn't do what he wanted, he wasn't afraid to coerce it with violence. There was no question whatsoever that he was its master.

While returning on a Dianaport flight to familiarize me with the *Bacobi* class deep-space couriers, an APU power processor quit. Another APU assumed the load, so we didn't lose astrogation alignment.

"I show you how to fix bad processors." Omer took me to the equipment bay. There he grabbed two protrusions on the bulkhead and directed a solid kick at a panel bearing the label, "CAUTION! Only qualified personnel can repair this unit!"

"When it stops, kick it," he told me. "This model stops regularly. I told Ali not to buy from lowest bidder."

"Omer, you might have busted something!" I complained. "We'd play hell getting back without astrogation gear!"

He pointed to the readouts. The unit had picked up its load. "Sandy, for years you believe what Aerospace Force told you."

"I'm still alive because of it."

"In spite of it," Omer corrected. "I was in *Frontovaia Aviatsiya* before becoming cosmonaut. We kept aircraft flying under conditions you would not believe. I was taught to *make* a machine do what I wanted; if it couldn't, it would tell me."

"And kill you in the process."

"Only if I let it." Omer indicated the now-working APU processor. "What would you do?"

"Shut it down and go back on the spare. Maintenance would fix it after I got back."

Omer shook his head. "Sandy, some day your life may depend on fixing something or doing without. Tell me what would happen if we lost all APU power."

"We'd lose the computer and autopilot."

"Consequences?"

"We might not get back to L-5."

"Aerospace Force thinking." Omer pointed to his eyes. "You have two eyes, good guidance system." He tapped his ear. "You have two ears. And you have optical instruments and comm gear. Three tracking stations follow us. 'Mayday' call would bring help, but we don't need it. We can astrogate by reference to Earth, Moon, and Sun. Do it." He reached out and shut down both APUs.

I'd been spoiled by high technology, but I made it back to L-5 without having to yell Mayday.

Space flight is mostly waiting. The old aviator's saying is also true for space: "Hours of boredom punctuated by moments of sheer terror." As Omer showed me the ins and outs of commercial space operations and got me current in Commonwealth space vehicles, it began to dawn on me exactly what had happened to me in the past few months. The more I thought about it, the more doubtful I became.

I'd thought of myself as a tiger only after Don Carlson, the class bully, beat me up in second grade. That led my pacifist father to proclaim from his ivory tower that fighting was a sign of barbarism and didn't settle anything. I was told that if I fought back the matter would only escalate to greater violence.

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After the second time Carlson beat me I began to doubt my father's wisdom. The third time I fought back and lost, but I became a less attractive sissy, and Carlson began to harass easier targets. By the time Carlson got bored beating up everybody else and jumped me again, I'd learned enough to beat hell out of him. I was punished by my father, but no school bully picked on me after that. I became a bully in my own right until little Jamie Tagfield stood up to me. After that, I gave up brawling and learned to get along with everyone except my father.

Over the years, society put more restraints on me. But when my life was threatened, they vanished. Maybe I was one mean sonofabitch underneath, but that didn't eliminate the doubts that had welled up in my mind following the Black Bear incident. *Was I really a military man capable of measured violence in service to a non-military boss?* Had my tiger leash been tightened so thoroughly that I wasn't really any good as a military person any longer?

Or was it the other way around? Was I now so committed to the commission of physical violence that I was no longer worthwhile as an educated military person?

Coming out of Vamori Free Space Port in the *Tybo,* sister ship to the *Tonolia,* I broached the subject with Omer after main engine shutdown occurred and STC confirmed our track to clearance tolerances.

"No, Sandy. You are slipping your leash."

"What do you mean?"

"You're a leashed tiger," he said. "When the leash comes off, you're as crazy as you think I am."

"Oh, really, Russkie?"

"*Da,* Yankee dog. That Black Bear pilot was trained as I was. You slipped your leash and got him first. But your service did not want tigers who slip their leashes."

"I can drive aerospace ships okay, but that's not what I meant. I came to the Commonwealth in response to an ad for a military aerospace pilot. I expected to learn new things in converting to commercial operations. But I didn't expect I'd be asked to be a military advisor. You're more qualified for it than I am."

"No, Sandy, you have something I do not," Omer said. "You have a military education. I will be happy to lead any attack squadron, air or space. That I can do. But I have not been educated in strategic doctrine, logistics, and tactical operations."

I knew what he meant. Although we'd served in our respective national military forces, I'd been taught the art of war, whereas he'd been trained as an empirical astronautical engineer-pilot who needed little knowledge of how or why people fought. "You would be a good staff officer if you had stayed on the tiger leash," Omer added.

"No, I'd be dead now."

"Probably. Black Bears have very accurate tracking and targeting equipment. You are one hot jock, Yankee. And you will also be a good *aide de camp* to The General."

It made me feel better that Omer had confidence in my abilities.

I'd willingly follow Omer into battle. He was a tiger-type who let it hang 'way

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out to see if he could get away with it. He was crazy with machinery, but he wouldn't waste the people who followed him.

When we docked at L-5, there was a message waiting for me. Tsaya wanted me to call. I wasted no time. Tsaya fascinated me; I wanted to learn what was under that shy facade.

But she was strictly business. "The General is doing well," she told me in her professional manner. "He wants to see you. It'll do him good to talk to someone other than me and the people in the Clinic."

I didn't want to visit The General in the hospital, because I don't like hospitals. Even the aseptic smell bothers me. I don't like to be around people suffering pain and illness. I especially don't like the appearance of badly burned people. I'd seen enough of that in the Aerospace Force.

Tsaya must have sensed my reluctance, because she told me she'd come along.

The Haeberle Clinic was in the Canadian L-5 module. I was pleasantly surprised to find it had no antiseptic smell. And I was even more surprised at The General's appearance. His face and hands were apparently untouched by the Karederu fire. Between pseudoflesh dressings covering areas of cloned skin grafts, areas of skin of varying color showed where first-degree burns were already healing. The aseptic membrane that surrounded his floating body separated us, but didn't prevent us from talking.

And it didn't keep The General from reaching out with both hands to the membrane. We touched with the barrier between us. The General was smiling.

"Thank you for coming, Sandy." The General's voice was as strong as it had been in Topawa, and his eyes were bright and sharp. "How are you getting on?"

"Reasonably, sir," I told him, "but the real question is: How are *you* getting on?"

"As well as can be expected, according to Tsaya, but much slower than I like. However, my doctor's beauty refreshes my day when she makes her rounds."

"She brightens up the day for many people, including me."

I thought Tsaya would blush, but she didn't. She smiled instead. When she was in her professional element, her shyness disappeared. "Sandy, The General's well known throughout the Commonwealth for his flattery," she said. "You'll grow used to it."

"Tsaya, you've never grown used to it. Neither has any other woman I've known," said The General. "And, Sandy, I'm not a baby-kissing politician."

"Not many generals are."

"Sometimes I wish my military title hadn't become my symbol. But I chanced to be in the right place at the right time to take command and do something worthwhile with it."

"That's the story of most successful military leaders," I said. "What would you rather be, General?"

"My father wanted me to be a trader like my forebears," he said. "I wanted to be an anthropologist and learn the history of human social institutions. But I am what I have become, and if people

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would rather look to me as The General, there's little I can do about it. I must be what I am publicly; I can be whom I want privately." He paused for a moment, rearranged his kaftan-like robe, and went on, "Sandy, I'm extremely pleased you accepted the position as my deputy for military affairs in Landlimo Corporation."

"I'm not certain I can do the job."

"I am."

"General, I know little about the Commonwealth and what you've already decided to do."

"With your background you can learn easily and quickly from Alichin, Omer, Vaivan . . ."

"But that will take time we don't have."

"I have lots of time in my present situation. And I'll enjoy teaching you, Sandy. It's boring to watch TV or read all day. I'm glad to have a deputy to talk to. Samuel Clemens said it better."

"Mark Twain? I don't follow you, General."

" 'War talk by men who have been in a war is always interesting; whereas moon talk by a poet who has not been in the moon is likely to be dull.' We can talk of both. I've seen and learned a lot in over a century . . ."

"General, you aren't over seventy," I objected.

"The General is one hundred and fifteen years old," Tsaya said.

That brought me up short. "I didn't think high-tech gerontology had . . ."

"Reached a low-tech place like the Commonwealth?" The General finished for me. "Don't underestimate us, Sandy. We've taken what we've needed from your high-tech world—and paid for it, I might add, because we're not looters and never have been."

"This is what I mean about my ignorance of your ways," I told him. "I had no idea Commonwealth doctors possessed expertise in biotechnology."

"It's not the sort of high-tech biotechnology you know," Tsaya said. "We've combined it with our own, although American biotechnologists have yet to accept what we've known and used for generations. They will eventually, but by that time we're likely to be far ahead of them. Right now, they call it witchcraft. It'll be integrated into medicine in this century just as acupuncture and other low-tech medicines were in the last century."

"You used acupuncture on Ali at Karederu Center."

Tsaya shook her head. "That's Chinese. I used something else. We have a great legacy of folk medicine." She paused, then asked, "Sandy, what do you think about magic and witchcraft?"

"The universe is full of strange things. I certainly don't know everything there is to know. Why do you ask?"

"I want to know what you think about things unexplained by science."

I shrugged. "I'm neutral. If something works, even though we don't understand it now, some day we'll manage to. If it doesn't work, why fret?"

Tsaya looked relieved. "Sandy, in high-tech they'd either ridicule or destroy me because I'm a witch, a respected profession in our culture. So I stand back from high-tech people until they understand I'm really a healer. But then, who isn't? Anybody can do it. I

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can teach even you, Sandy." There wasn't a bit of recalcitrance in her attitude now. She hadn't been shy after all, just frightened. Doctor Tsaya Stoak became fathomable.

"Some day, Tsaya, after we manage to keep the jackals at bay," I promised.

"I like your analogy," said The General. "We've got to keep them at bay until we're too strong for them."

"Then what, General?" This was a critical question that had been nagging at me ever since I'd become exposed to the free-wheeling free market culture of the Commonwealth. "Once the Commonwealth becomes powerful, what restrains it? What keeps it from trying to conquer the world? What damps greed in this free-market state?"

The General replied simply. "A philosophy we all know and follow."

"Suppose I took over as absolute dictator and set out to conquer the world?"

The General sighed. "Sandy, your namesake Alexander the Great lived in a world of scarcity where there wasn't quite enough to go around. In my lifetime that's changed. But people's perceptions and thinking haven't. We no longer live in a marginal system. There's no reason for anyone to starve now."

"A lot of people in the world *are* starving right now," I said.

"They don't have to. We didn't."

"You were different."

"How?"

"Uh, well, I can't explain it yet."

"What did I tell you at Karederu about acting like a slave?"

"But a starving free person is just like a starving slave."

"To a free person, starvation is a temporary condition to be suffered until game can be killed or crops harvested," The General said. "We set out to make better lives for ourselves. But, unlike most of the others, we knew we had to do it ourselves. No one was going to step in and save us. We bootstrapped ourselves over centuries of slow and painful development by using our heads instead of our fists."

"So what's going to restrain the Commonwealth when we win?"

"You've heard of metalaw?" The General asked.

"I was exposed to it in case we ran into ETs."

"But you weren't encouraged to apply metalaw in contacts with intelligent terrestrial life?"

"That's hard to do, General."

"It is if you're dealing with the classical peasant economy."

"What's that?"

"Didn't they teach you any sociology and anthropology?"

"Only what we'd need as officers."

"Pity. Sandy, the human race has evolved in a peasant economy where, if things were the best they could possibly be, everyone had a little of everything but no one had very much of anything." General Vamori paused, then said with great emphasis, "It isn't necessary to live that way! *There's plenty for everyone!* There will always be plenty for everyone from now on! By using our minds and applying technology wisely, we're using the Earth and, at last, the Solar System. Sandy, what happens to greed when manna falls from the sky in such great abundance that it becomes senseless to hoard it?"

"Somebody will corner the market

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on manna and create an artificial shortage," I told him.

"Not if there's competition," The General said. "Universal abundance makes monopolies, cartels, price-fixing, and other non-competitive activities ineffective and too costly."

"General, with all due respect," I told him with some exasperation, "it can't stop greed. That's part of human nature we'll never eliminate, just as we'll never get rid of the desire to fight."

"Sandy, you're not looking at the system properly. It's bigger than you think. It's not just the Earth with all its untapped potential, although that's enough for some people. The system now includes the moon, the planetoids, and the Galilean satellites." The General looked thoughtful for a moment, started to say something, stopped, then finally added carefully, "Americans almost had it. *Almost*. They came agonizingly close. Your forefathers began to understand there was plenty for everyone. But they panicked when they started to be successful. It was different. It was new. It had no track record, as they once said. It seemed too good to be true, so something *had* to be wrong."

The old man relaxed in weightlessness, slipping into an open foetal position impossible on Earth—legs bent, back slightly arched, limbs floating, all muscles totally unstressed. "When everybody can have as much as they want without exhausting physical labor, greed goes away. Hoard if you want. Stash it away by the ton if you wish. Pile it up in the streets until you have no place left to put it. What value does it have then?"

"It's valuable when you've cornered the total supply," I said.

"But you can't! There's always more! Then what do you do with all you've managed to hoard? You can use only so much of it. What are you going to do with the rest?"

"I'd swap it for something I don't have that I want and that somebody else has."

"That's greed?"

"No, that's trade."

"That's what the Commonwealth's doing. We're probably the first people in history to understand there's so much of everything that it can't be controlled by monopolies, cartels, politics, police, or state capitalism. And it can't be taken away from armed traders without trading for something of equal value."

"Seems to me you're talking a supersophisticated form of socialism," I said. "If you're basing the system on abundance and free trade, you won't need money, for example."

"Oh, but we do. It's one of the greatest of all human inventions. With it, we can trade with or for something in the future that doesn't exist yet. It's only score-keeping."

I was out of my element, and I knew it. Money was something that was fairly easy to come by if I worked for it, and it was primarily useful for buying bread and butter. I didn't try to fathom economics. My standard of exchange was breakfast. Anywhere in the U.S., a good breakfast cost about ten dollars, and I used that yardstick to figure the value of currency when I was in other countries. I considered my primitive method of determining monetary value to be basic economics.

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But I had to admit something to the old man. "General, the Commonwealth doesn't make sense to me yet. But I can live in it. But tell me something: How does the son of a merchant become a general and evolve into a social philosopher?"

It was a moment before The General answered. "I was once befriended by an anthropologist who came to the old land of Mitanni to dig. He got me interested in where the human race had been and where it could go if it wanted to. I took my doctorate at the University of Pennsylvania and started the Department of Anthropology at the University of Topawa.

"Then Colonel Joseph T. Chase set himself up as 'maximum ruler' and started looting the people who'd hired him to get rid of bandits. He wanted power as well as immunity from the responsibility that accompanies power. I accidentally found myself in his path. The rest is history."

"The history books say you're a man with a mission who took command of the native military groups to save your people and your country from a dictator."

"The history books lie," The General replied gently. "They always do. But history happened in spite of the historians. I stepped in to save myself and my family. Perhaps the historians will re-evaluate thier conjectures in a century or so when our experiment is completed. We're still in the midst of it. And the crucial stage is about to begin. I'm incapacitated in Ell-Five, so you may have to fit temporarily into my 'jack boots' and lead in my stead, Sandy."

I was totally taken aback by this. "General, I didn't come to the Commonwealth to assume a role in your government. I couldn't be a leader for your people! What makes you think they'd follow me?"

"If you show you're a leader, they'll follow."

"How do you know I'm not another Colonel Joseph T. Chase?"

"I knew him and I know you."

"How long have you 'known' me, General? A couple of days? How could you really know me?"

Again, a long pause before The General said, "I'm not immortal. Someone must fill my place. That person mustn't be exactly like me, because conditions aren't as they were fifty years ago. For a quarter of a century I've seen many promising young people come along, only to destroy themselves with poor judgement and wishful thinking. I've kept tabs on you, Sandy, from the day you graduated from the Academy. But you aren't unique, because I've tracked your colleagues and others as well throughout the world. And you weren't selected. Like me in Topawa fifty years ago, you happened to be in the right place at the right time. I really hope you'll make the grade, Sandy, because you haven't destroyed your potential yet."

"Again I ask, how can you be sure I'm not another Chase?"

"I can't. But I'm willing to risk it. We must always be ready to take calculated risks. Even if I were wrong about you, however, the Commonwealth now has the proper checks and balances to prevent another Chase incident. And Commonwealth people know they live in a universe of abundance."

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"But this should be a job for one of your family—Alichin, for example."

The General shook his head. "They're fighters but not tigers. Alichin is a good planner, a rebellious frontiersman, a businessman, a merchant, and a trader. He knows this, and of my feeling toward you."

"General, you're laying a hell of a big burden on me. I'm not sure I'll accept it."

The old man tried to reach out to touch me, but the aseptic membrane halted his hand. He smiled broadly. "Sandy, in spite of my age, I'm likely to be around for another twenty years. Doctor Tsaya here tells me in so many words that I'm too mean to die. Be that as it may, you're not faced with the possibility immediately. There's no vacuum that will draw you in quickly. It just seems that way, because of the leadership vacuum apparently produced by the Karederu fire. But it's only partial and temporary until I heal. It gives you an opportunity as my deputy to learn what's going on." He smiled and withdrew his hand. "It sounds like a big responsibility, but for a long time I may use you only as a go-fer, Sandy."

I hoped he was right.

"The General enjoyed your visit," Tsaya said as we left the Haeberle Clinic. "But don't be overawed by him. He's just a human being."

"There's no such thing as 'just a human being.' "

"I didn't mean it that way," Tsaya said. "A lot of people in the Commonwealth think he's a god."

"To me The General's the Grand Old Man of the Commonwealth, the father image," I told her as we moved down the corridor.

"Of course. It's going to be a long time before we shed the need for a father image, if we ever do. It's such a deep part of the human psyche that medical and mental lore is full of the symbolism of it."

We passed the League of Free Traders' Lounge. "Hungry?" I asked.

"Yes, but just a snack," she replied. "I have to watch my weight. I don't want to end up like those fat, jolly old mama types in the Topawa marketplace."

I gave Tsaya an admiring once-over. Gone were the loose cotton pull-overs and tunics of the tropical Commonwealth. Tsaya wore a white body stocking and a white tailored tunic, with slippers on her feet. Her long hair was held above her head in a net.

"I can't picture you as a fat old mama," I said with admiration. "You're certainly in a position to take advantage of the biocosmetic centers in Europe and America."

"I don't intend to have to," she said as we sat at a table. She punched up fruit cocktail and hot *chai*. Out of old habit, I ordered the usual duty drink of an Aerospace Force officer: milk. She went on, "But I'll begin to exhibit the Rensch Syndrome if I'm not careful. My ancestors came from the Toak Plains near Manitu, from the Arabian peninsula, and from the Iranian plateau. Hot places, all of them. For me, extra calories turn into fatty tissue located where it interferes least with body movement and cooling—my buttocks and breasts."

"I thought Commonwealth people were well hybridized by now."

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Tsaya shook her head. "Three to five generations aren't enough. It may take ten. It took far longer than that in America because you had social barriers. We don't. But on the other hand, we don't know what we're hybridizing for."

"Pardon?"

"Our future is in space. What human characteristics are optimal for that? Today the Japanese are good at living in cramped tin cans in space. They're adaptable and have a social system that's eminently suited to it."

"Cramped tin cans won't last," I argued. "*Homo spatial* ought to be nonspecialized, able to function anywhere there's oxygen partial pressure from a hundred to five hundred millibars, temperature from zero to fifty Celsius, and gravity from three gees down to weightlessness."

Our orders came up on the call board; I picked them up, parted with food chits, and returned to the table. Tsaya had thought about what I'd said because she told me, "I can't argue that from the physiological standpoint. But how about the social aspects?"

"As you pointed out, the Japanese do well out here."

She squeezed *chai* out of the tube and smiled. I liked her smile. "But we're going to do better."

"How?"

"Where's your iklawa?" she asked with sudden coolness.

"Is that the dagger you all wear?"

"That's right. The word comes from the sound of the blade being pulled from the body of an enemy." Tsaya lowered her right hand to her waist. The knife was in plain sight, but she was wearing it so naturally that I hadn't noticed it. "Arm yourself, citizen. Or are you ashamed of living?"

"Uh, sorry," I apologized. "I didn't think I'd be permitted to wear a weapon in a space facility."

"Others expect us to be armed. It's the mark of a citizen of the Commonwealth." She put both hands on the table and went on in a pleasant voice, "Do you have an iklawa, or would you like to borrow one of mine?"

"Can I, uh, borrow one, Tsaya?"

"Of course." She produced another small ornamental knife and its scabbard from under the flap of her body tunic and handed it to me. "I drew this at Karederu. Consider it a gift of welcome."

"I'll do that, and thank you. But what does this have to do with the social aspects of space?"

"Everything. The Japanese are polite because of cultural training. But we're polite to one another now because there's no conflict between us; we wouldn't be polite if one of us had something the other wanted and thought it could be taken by force without suffering any immediate physical consequences. When you're openly armed and apparently capable of defending yourself, you'll be politely treated with good manners."

"Maybe, but it seems to me it encourages murder."

"Quite the contrary. Elsewhere in space, there've been the usual per capita ratio of fights, injuries, and murders. There have been no murders in Commonwealth space habitats. The deaths in our module were outlanders who

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didn't believe our willingness to protect ourselves."

"So you think we're going to be the best space people because of both hybridization and personal weaponry?"

"It worked in America before it got messed up," Tsaya reminded me. "We learned a lot from Americans. They were a dynamic, forceful, successful people. They made mistakes, but we're not going to make the same ones. And it did get messed up. Look at what happened to you, Sandy."

I found I couldn't argue with her. I already respected her and now I was beginning to like her. "Tsaya, I had you figured all wrong."

"Oh? What did you formerly think of me, and what caused you to change your mind?"

"You seemed to be a shy wallflower until the place went up in flames," I said. "You were frightened of me to the extent you had your iklawa pricking me."

"But I didn't know you then."

"Obviously, neither did I."

"I'm getting to know you better."

"So am I."

"I like you, Sandy."

"The feeling's mutual, *moapa*."

Tsaya bristled. "Don't you dare use that word! The fact that we happen to like one another well enough to eat together does *not* mean you have my trust and confidence as a *moapa!* It'll be a long time before you're privileged to use that term with me!"

"I apologize! No insult intended, Tsaya!"

Tsaya sighed deeply and brought herself under control. "My apologies, too. I forget you're still a stranger among us. I'll try to compensate for it. But be careful; others might not."

That aborted our tête-à-tête. I was going to have to learn it was not proper to eat with my knife, wipe my hands on the table linen, and make messes on the living room carpet. I was going to have to become civilized according to *them*. I was going to have to be careful about using terms I didn't understand as well as misinterpreting Commonwealth customs I was just beginning to learn. I kept fitting these Commonwealth people in the molds of American stereotypes, and they wouldn't and didn't fit.

I would have been a lousy embassy aerospace attache. Probably would have ended up *persona non grata*. But if I wasn't careful here, I might end up *persona non vita*.

Living is a lot like flying: long periods in which nothing happens separated by moments of frenetic activity. Most people relish the periods of inactivity and then hit the panic switch when everything turns to slime. A survival type uses inactive periods to prepare for the next time it hits the impeller. I'm a survival type.

Part of my training was taken over by Ursila Peri. A strong-willed young woman, she was different from Omer Astrabadi in ways other than physical. She drilled into me the procedures and techniques of deep-space, intra-orbital commercial piloting. This is mostly procedural, doing the right things at the right time to keep the various military forces in space from getting antsy. Sometimes it involved rather complex trajectories that needed a lot of computer power. It helps to have computers take

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over the details of making a ship go where you want. Computers might have been able to do it all, but nobody in his right mind wanted to trust human life in space exclusively to them.

Besides, a computer doesn't have the human concept of "fun."

The fun of space travel was more than just getting from A to B successfully. Any computer could do that. "Fun" being an alogical emotion, it was strictly a human activity. It was hanging things out a little bit, daring the universe, and taking a risk.

Omer tended to ignore the computers and take great, big, juicy risks of the sort that scared hell out of me.

On the other hand, Ursila used computers as tools. She monitored them and let them do things she could have done just as well.

I fell somewhere in between Ursila and Omer. I used computers, but I never trusted them. There's always the possibility of the occurrence that falls outside the three-sigma limit of probability that computers were designed to handle . . . the sort of thing that keeps sports from becoming cut-and-dried exhibitions of physical prowess. There's always the guy who isn't where he's supposed to be when he's supposed to be there, and there's always someone who fumbles the ball. This same principle kept human space pilots from becoming obsolete.

I liked Ursila. She was an attractive, provocative, highly competent woman who had the strange ability to shift from being coolly all-business to warmly sociable like Tsaya. In some ways she was very British, and in other ways American. During a flight with her, I remarked, "Ursila, you needle me about my American ways. I probably deserve it because I'm provincial and naive. Are you American?"

"If our families hadn't lived alongside each other for more than two hundred years, I'd feel insulted," Ursila replied without rancor. "I'm Canadian."

"Sorry, I should have known," I said. "There seem to be a lot of Canadians in space."

Ursila checked a display, then looked levelly at me. "You Yanks aren't the only ones with a frontier heritage. Ever been on the Canadian Shield?"

I'd been trained *not* to punch out over the Shield, because there was little chance of survival.

"That's still our frontier. We've had a constant coming and going from the wilds to the settled areas. It's almost a rhythm in Canadian life," Ursila said. "Does that answer your question?"

It did. And it gave me another important clue to the deep relationship between Ursila and Ali. If she and Ali hadn't had it going 100% between them, I would have become extremely interested, because I wasn't having much success with Tsaya Stoak.

Tsaya and I became close friends . . . period. To be sure, our friendship grew and expanded as I spent time with her, talking to The General and taking our few moments of free time together. But for some reason our relationship didn't progress to the physical point. Tsaya seemed an introverted person who was working hard to overcome it. Since we didn't share the same background, it was impossible for me to

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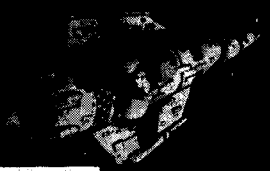

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make any sort of reasonable assessment of the situation.

Otherwise, I was very busy. The Commonwealth had extensive facilities and operations in the Earth-Moon system. At that point in the development of space industrialization, most of the risk capital still came from Earth. The big terrestrial multinationals were still involved—Exxo-Krupp, Atoshi & Kalidasha, CanIntel, AmArab General, and Embra Punto, among others. The various Commonwealth corporations dealt with everyone and supplied essential services including drayage, factoring, exchange, arbitrage, proctoring, astrocabotage, brokering, and the many commercial activities that go on below the surface of trade and exchange. Although some Commonwealth firms were involved directly in space industry, they were careful not to become competition to the biggies.

The Commonwealth seemed to be happy to hold a small percentage of a market or take just a smidgen off the top, nothing more than a minor business expense that wouldn't justify the time and effort to bypass the percentage or to eliminate the minor competition. Commonwealth space entrepreneurs were following their classical Earthside policies. They were doing well by doing good, following The General's philosophy that this was a system of plenty with enough to go around.

I began to understand The General's strategy. We were at a turning point between a system of scarcity and a system of plenty. The General had the Commonwealth already working with the system of plenty. At the same time,

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it was capable of handling those who still operated with the well-understood world of scarcity.

That was the true weapon of the Commonwealth.

But there were others, too.

Omer wanted me to see the latest "toy." He took me to a remote hangar at the far end of the ComSpat module where maintenance and repair was done inside pressurized bays if possible, but outside in vacuum if the ship was big. In the bay rested a small black ship. Ursila was inspecting it when we arrived.

The "toy" was about the same size as the Aerospace Force SF-16 *ASP* but had six-degree-of-freedom maneuvering engines, a large main engine, thick arrow wings, and both radar and lidar stealth shape.

"Looks like a highly modified Embrastrel *Preto Passaro,*" I said as I viewed its fascinating lines. "But that design was obsolete ten years ago."

Omer smiled. "It is what you think it is. We bought a dozen at a very good price from the Forca Estrella Natalia. Sriharikota re-engined them to our specs. Then the Pitoika Drydock and Ship Company put in the finishing touches," he said proudly. "How do you think we're going to use it?"

I ventured, "It's got tremendous delta-vee reserve and can probably be flown across the atmospheric interface. But the aerodynamics and structures are archaic! Its skin will never withstand an entry at more than vee-sub-ee. These little spikes on the leading surfaces would go bye-bye right away!"

"I didn't suspect you'd notice," Ursila said, fingering one of the blunted spikes that were arrayed on the front of the fuselage and wings. "I discovered data buried under security wraps at the old Wright-Patterson Aerospace Base since 1965 and then forgotten in the U.S. National Archives. These are electroaerodynamic ionodes. By putting an electrostatic charge on the space craft body and creating a charge sheath around it, the air flow can be tailored even at hypersonic speeds." When I looked dubious, she went on, "Want to see the equations?"

I thought about all this for a moment, then asked them, "You're not really serious about using this as a good old science-fiction space fighter, are you?"

"Why not? Nobody else has one. If we get into a shooting war, a squadron of these can raise hell in space and Earthside," Ursila said.

Omer grinned. "It's fun to drive this at Mach-Fifteen only a hundred meters off the deck. The shock wave carpet uproots trees!"

"Know why the Aerospace Force opted out of little birds?" I asked. "Space lasers can burn them out of the sky, that's why. Space fighters and even space cruisers are scouts, and scouts are expendable. And expensive, when they're manned."

"You're missing something," Ursila pointed out. "These are knobby with verniers."

"So?"

"What're the biggest problems faced by space laser battle stations?"

"Detection and targeting. Then it takes a second or two to slew, aim, and fire."

"A skalavan can survive in the di-

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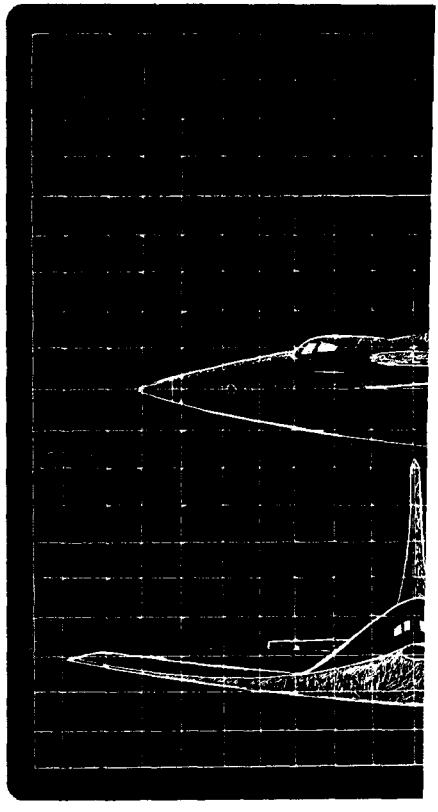
rected energy weapon environment because it has tracking sensors and can zang out of the way before the laser can be fired. It has the ultimate defense against a hell beam: Be where it ain't."

"Nice theory."

"Want proof? Omer, help me strap him in, then I'll take the *Shontu* and you strap on the *Taibu*. Time to have a little fun! Sandy, just *try* to hit either of us with boresight laser!"

The next hour of hard maneuvering trying to pin my practice laser on either ship and trying to shake both of them off my tail was enough to convince me. The Commonwealth indeed had the first effective space fighter; the name "skalavan" was after the old fast and maneuverable Malagasy sailing vessel. It was such a hot item that I knew Omer was right when he told me I wouldn't qualify to fly it in combat. "You and Ursila do not have fast reflexes," he told me. "I do. I flew with *Frontovaia Aviatsiya* Mach-Five on the deck."



I was glad to know the skalavans were available, but I hoped we'd never need them.

But then again, we might. We watched and waited, and a strange thing began to happen:

The activity at Vamori Free Space Port went down to 64% of the pre-embargo level, then began to increase.

During our daily staff telecon, I questioned this data. "Why?"

Wahak went through his usual ritual of checking the hard-copy data on the table in front of him, then reported, "Kevin Graham at the League says it's because of the imposed duties at the other space ports. All ships belonging

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to members of the League of Free Traders are registered in the Commonwealth because our fees are low to cover only the computer time for logging, and nearly all the League ships are now using Vamori-Free. We're starting to handle ships registered in countries such as Annam, Sri Lanka, Liberia, Echebar, and Surinam. Even some Chinese manifests have gone through Vamori-Free. As long as we keep it open to space, we'll get tonnage, especially from those who want to avoid the Santa Fe tariffs."

"This can't go on."

"Why, Sandy?" Vaivan asked.

"Someone will try to plug the leak before it gets worse. Wahak, run a projection forecast. How long before we can expect one hundred percent at Vamori-Free again, based on the trend of the data you now have?"

He turned to his keypad. The answer didn't take long. "At present rate, sixty-two days."

"The traffic's going to increase on a cubic curve," I advised.

"That can't be justified," Wahak replied.

"Yes it can. The cubic curve's a standard projection, Wahak," Ali told him.

"It's outrageous."

"So's the rest of the universe that operates with it," Ali fired back. He called up Wahak's computer display on our own VDT, then punched in a correction on our keypad. "Let's see what the cubic forecast says . . . Well!"

Vaivan said, "Twenty-two days to reach a hundred-percent level at Vamori-Free."

"I don't believe it," Wahak stated flatly.

"Tell me that in three weeks," said Ali.

"That will probably be too late," I added.

"Too late?"

"Wahak, look," I told him. "We aren't the only ones with access to this data. Tripartite comptrollers and planners have it, too. There's some delay in their system because they'll have to convince their superiors. I'll give them three days to do that, plus four days for Tripartite leaders to make up their minds what to do, and two days for them to act. Be ready for something to happen in a week or so, just to be on the safe side."

"Any ideas what it might be?" Ali asked us all.

There was silence among the Landlimo Corporation's executive planning group and its military advisor.

"Blockade?" Wahak suggested.

"Too many treaties and trade agreements prevent it," Alichin reminded him.

"Expect traffic delays from STC," Vaivan said, "and some clearance refusals on the pretext of military necessity."

"No military emergency," Ali objected.

"They'll make one," I said.

Ali didn't agree. "There may be some delays in Space Traffic Control centers, but they'll cite equipment breakdowns or traffic overloads due to the activity shift caused by the Santa Fe tariffs at various hubs. They can't shut down space operations any more than they can stop air commerce."

"We're secure," Vaivan reported. "Short of open warfare, Vamori Free

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Space Port can't be shut down. Traffic originating or terminating at Commonwealth facilities can't be touched. Insofar as open warfare goes, the Commonwealth impys are on alert, and there have been no military build-ups or activity beyond our borders."

We kicked it around for another thirty minutes without coming up with anything that seemed reasonable or within the capabilities or intentions of possible antagonists.

"Be prepared for something to happen in about a week," I finally told them. "We don't know what it will be, but they dropped the first shoe in Santa Fe. When they'll drop the other shoe remains to be seen, but drop it they will."

I had to explain what I meant about dropping shoes.

And we didn't have to wait long for the Tripartite to do it.

"Powersat Corporation, InPowSat, and InSolSat just cut SPS power beams to eleven rectennas in small countries," Shaiko Stoak reported.

It was the middle of the night in L-5, so the telecon was obviously an emergency. The Landlimo Corporation people on Earth were accompanied by Captain Kevin Graham, and the level of concern was evidenced by the fact that Rayo Sabinos Vamori was on the net along with Shaiko Stoak, CEO of Commonwealth Glaser, and Donalo Jon Tomason from the engineering firm Rose & Mariyama, Inc. Corner montages showed Heinrich von Undine in Topawa and Trip Sinclair in Houston.

"We expected something like that," Ali spoke up from where he sat next to me. "I think I know who they pulled the plug on, but tell me anyway."

Stoak named them: "Rectennas are cold at Echebar, Negri Sembilan, Selangor, Tongan, Hanian, Dragona, Natalia, Ugarit, Mazara, and Ghanzhi. Notice to expect cessation of service has been tendered at Alderney, Nireg, Atacama, Sorat, Annom, and Tregganu, plus nine rectennas in mainland China."

"Any reasons given?" Ali asked curtly.

"Default on power bill payment in some cases. Others were told their credit lines had been re-evaluated," Sinclair reported.

Shaiko Stoak—I could see Tsaya's resemblance to her father—said, "We wouldn't reduce a credit line without consultation. That's an excuse!"

"Of course, Shaiko," Rayo Vamori said. "The eleven cut off the powersat net have either diverted their space traffic to the Commonwealth or ignored the Santa Fe embargo."

"We've been diverting manifests destined for those countries," Kevin Graham put in. "In some cases, inbound captains got instructions in midflight from their contractors to divert to Vamori-Free."

"The General should be here," Vaivan insisted.

I put in, "I'm his deputy."

"With no offense intended, Sandy," Rayo said, "we need The General's advice."

"Learn to get along without it. You're doing fine so far."

"How much capacity has been dropped off the powersat net?" Ali tried to get back on track.

"Fourteen gigawatts," Shaiko re-

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ported. "The cut-offs involved split beams, so no powersat is totally off-line, but One-Zero-Five-East and Six-Zero-East have near-zero loads."

I didn't like that. "Which powersats will have near-zero if they pull the plug on Annom, Nireg, and Sorat?"

Shaiko consulted a nearby display. "Two-Zero-East and One-Zero-Five-East."

"That drops One-Zero-Five-East down to zilch, doesn't it?"

"Pardon?"

"Any load left on One-Zero-Five-East if Annom and Sorat go off?"

"No."

"What are you worried about, Sandy?" It was Vaivan who caught my concern.

"A ten-gigawatt powersat can pump a *big* laser, Vaivan," I said. A high-energy laser—they're called hell beamers from their acronym, H-E-L—is limited in beam power density and range only by its energy source. If it's a self-contained unit, the space facility is large and vulnerable. But if a hell-beamer's energized remotely, it's small and hard to identify. I was worried. "One-Zero-Five-East could put its ten gigawatts into a hell-beamer that could punch a beam right down to surface from GEO!"

This was obviously news to them. Rayo Vamori broke the silence. "Is there a battle station over us?"

"They're over *all* parts of the world in inclined geosynchronous orbits. League captains have spotted them."

Ali said slowly, "Time to pay Peter Rutledge a visit."

I went with Ali to the Resident Inspection Organization's headquarters, GEO Base Zero. Ali needed a pilot, and he wanted me to meet those upon whom the delicate stability of space power depended. And the approach to RIO Headquarters was a two-man job.

The first challenge came at a thousand kilometers. We answered with the proper transponder code. Then we had to close at no more than ten meters per second, matching orbits and station-keeping ten klicks behind at zero closure rate. Then we were thoroughly scanned. Once we proved we were sweet, pure, and unrefined as well as incapable of swatting a bee in revenge for being stung, they put an RIO pilot aboard. She strapped into the jump seat between Ali and me. It's disturbing to sit next to someone wearing about twenty kilos of Comp-X around her waist. Judging from her accent as she reported on her comm set to RIO Approach, she was Japanese. I knew she wouldn't hesitate to self-destruct and take the ship and the two of us with her if we tried to ram GEO Base Zero.

The portlock guard was polite but firm: We had to leave our iklawas there. Nobody was armed in GEO Base Zero; RIO members were deliberately unarmed at all times. An escort led us to the quarters of Inspector Peter Rogers Rutledge.

Peter Rutledge was veddy British even to his gingery mustache, which matched his red hair. He would have looked at home in the officer's mess of any Royal Aerospace Force station. RIO policies tried to eliminate all national tags, but they weren't successful. Knowing the British, I doubted that RIO would ever be able to strip Rutledge of his English appearance and manner-

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isms; they were as deeply rooted as my own American traits.

Rutledge spotted it immediately we were introduced by Ali. "I say, another Yank for your cause! Good show, Ali! You Commonwealth blighters are building quite an international cadre. I dare say you might become as multinational as we like to believe we are in RIO."

"We use all the help we can get, Peter. . . ."

"On your terms, of course."

"One Colonel Chase is enough for anybody."

"Right-o. Never caught the bloody mercenary, have you? Pity Interpol isn't what it used to be. Well, I can't offer you civilized hospitality of a drink or even tea. Policy." As we slipped into stools around his conference table, Rutledge went on, "Best get on with business. What was so bloody important that you couldn't ring me up, Ali?"

"PowerSat cut back output to eleven rectennas," Ali began.

"We know that, old chap. Resident teams are on every powersat, you know. And we have rather secure signals systems . . ."

"That leaves some powersats with excess capacity."

Rutledge nodded. "We don't anticipate that to last. PowerSat Corporation can't afford to have idle capacity. Stockholders will begin to complain about the next quarterly report and they'll make more nuisance if the declining quantity of delivered power is reflected in the stock markets."

"It already is," Ali pointed out. "PowerSat dropped five points today in Houston, three in New York, and seven in London and Hong King."

"PowerSat's financial situation wasn't why you came to chat."

"You understand why PowerSat is pulling the plug?"

"Something to do with a meeting in Santa Fe. I seem to recall you were there for a time."

Ali nodded. "Peter, I'd appreciate it if you'd keep an eye on powersat One-Zero-Five-East."

"Oh?" There was an entire question in the word.

"If PowerSat carries through its threat to cut space power to Annom and Sorat, One-Zero-Five-East won't have any customers on the ground," Ali said.

"And we have a tendency to get a bit nervous with ten gigs sitting idle above our horizon," I added.

"Oh?" Again the complete question in a single word.

"The United States Aerospace Force has a number of stealthed objects in a sixty-degree-inclination geosynch orbit." I didn't know how much Rutledge knew, but I didn't tell him everything. "Some of them are hell beamers."

"Really?"

"Do you know something about them?"

"Something."

"Well, Inspector," I said with a sigh, "I just wanted to make sure you realized that the power beam of One-Zero-Five-East could be redirected to power a large hell-beamer."

"We're rather well aware of a number of things," Rutledge replied in an off-handed manner. "But, Ali, I'm rather glad you thought to call One-Zero-Five-East to my attention. It confirms some information we've come onto. I suspect we'll lay on some ad-

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ditional surveillance and stand ready to take whatever steps we can to keep the balloon from going up.''

''Peter,'' Ali put in quietly, ''you should also be aware that we're ready, willing, and able to help.''

''And perhaps take action yourself?'' Rutledge smiled slightly.

Ali nodded. ''If we have to.''

''Redirection of a power beam to a hell-beamer might be considered an act of war,'' I added.

''If the situation escalates that far, old chap, your Landlimo Corporation will also find itself rather actively occupied. Oh, don't raise your eyebrows, Ali! What makes you think I wouldn't know what you're doing?''

''You and who else?''

''Come, now! We wouldn't enjoy one another's trust if either of us were to run hither and yon snitching like school boys, would we? I need to know these things as vitally as you do, should RIO have to take appropriate action.''

''What sort of action would RIO take, Peter? I know your Commandant. He's a principled man who hates to fight,'' Ali fired back. ''The modern incarnation of his national hero, Good Soldier Shweik.''

Rutledge said nothing for a moment, but pulled at the ends of his ginger mustache. ''Sometimes one needs a Good Soldier Shweik, old chap. After all, it's not RIO's responsibility to fight. We're just supposed to give the warning. We're sentries. We'll sound the alarm, should we detect something awry.''

''Then stand aside and let the blokes go at it?'' Ali mimicked.

''As I'm certain you're well aware, Ali, sentries are often capable of defending themselves.''

''Peter, I think you're going to have to. You'll be right in the middle of it.''

''Hah! Yas! There is that, isn't there? RIO must defend itself, mustn't it, especially after it's done its job and things get a bit sticky, what? But don't be so certain things will progress that far, Ali.'' Rutledge paused, then disengaged himself from the table, indicating he considered the meeting over. ''If it does come to trading swats, we'll all be in the thicket, chaps. Jolly good that you're siding with the Commonwealth, Baldwin. As for One-Zero-Five-East, one of my spot teams will likely pop over and have a look.''

Neither Ali nor I said anything until after we'd returned to our ship, undocked, threaded the needle of clearances and vectors, and dropped the RIO pilot. In trajectory back to L-5, I asked, ''What did you make of that, Ali?''

His answer surprised me. ''Peter Rutledge is on our side.''

''Really? He was as noncommittal as a loan officer. If Peter Rutledge is on our side, then he's violating his RIO oath. And he certainly didn't act like a person taking sides.''

''Sandy, he was in his office,'' Ali reminded me. ''You've heard the old saw about *quis custodiet*. . . .''

I thought about that one for several minutes.

The Resident Inspection Organization had been the factor which permitted the powersat network. Without impartial inspection, who was to know if a powersat also contained a hell beamer? Who could have ascertained whether or not

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an attack satellite was hidden in the structures of the photovoltaic panels? And who'd be sure that the power beam wouldn't be diverted—as Ali and I now feared—from the ground rectenna to an otherwise passive and silent hell beamer satellite? Could someone really pirate the pilot beam that kept the power beam phased on the rectenna and then concentrate several power beams on an Earth or space target, even though the power density of a single powersat beam is only one-fifteenth that of a microwave oven?

These unanswered questions posed a military threat which in turn made a powersat a military target, because nobody could take chances if an armed conflict appeared imminent.

A powersat—square kilometers of solar panels—is terribly vulnerable. No entrepreneur, financier, banker, or investor would have risked a worn penny on a powersat that was a certain target in the opening moments of any future war. Neither Lloyd's nor Macao's would or could have underwritten the insurance required for the long-term financing.

Obviously a non-political international inspection organization was required. But how could it be organized, financed, and operated to insure that it remained non-national? That had been an enormous problem.

Technology always creates the new social organizations necessary to finance, manage, and control it. RIO was organized at the Hartford Convention and funded by the groups who'd lose the most if a powersat were attacked. The damage or destruction of a multi-billion-dollar powersat would be an expensive loss to the insurance underwriters.

The world needed space power, and insurance was the critical bottleneck. The fraction of a percent that was tagged onto the kilowatt-hour consumer electric bill amounted to billions of dollars in insurance premiums, which more than paid for the 2,000 unarmed RIO inspectors and specialists with their independent communications and transportation systems.

RIO was very effective. If a resident team or one of the ubiquitous spot-inspection teams under the command of Rutledge found something unusual, there were two options open to the team leader: (a) report it covertly to RIO Headquarters for evaluation there; or (b) in a real emergency communicate the military activity to *everybody*. In the latter case, it was then important for RIO to get out of the line of fire.

Because of its unique anational character and novel operational methods, RIO often acted in strange and unfathomable ways. RIO posed no military threat to anyone, but the threat of its capability to saturate the comm/info network with the danger cry of the watch dog was a sure and certain restraint on military space activities.

I knew that RIO intelligence operations penetrated deeply into every military organization in the world. It wouldn't have surprised me if their intelligence activities also embraced the world of commerce.

A lot of military planners had spent a lot of time and effort drafting plans and programs for circumventing RIO. The Aerospace Force—whose job ostensibly was to keep and guard the

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peace, too—had continual, highly classified think-tank activity going on "should it be necessary to activate such plans and programs." But the job of *any* military service is to ensure the security of its nation. It was said a long time ago that "all's fair in love and war." Sad, but only partly true.

Finally, I said, "I guess Rutledge went as far as he could, under the circumstances."

"That's right," Ali replied simply. "But when things get dicey, as Peter would put it, we can count on RIO."

"How? They're unarmed."

"So were you on the Topawa Airport railway platform."

"Now you've got me worried, Ali. If you can suborn RIO, someone else can, too. Who else has gotten to them? My God, if they're that susceptible to violating world trust . . . ."

"They're not capable of being suborned or even of violating their oaths," he said. "But Peter has some discretion concerning whether or not to make a public announcement of detected military activities on a powersat. He knows that I know that he won't waffle. He'll yell. He may yell in my direction first. He'll do that even over the head of the RIO commander, because Commandant Otasek will double-check and triple-evaluate the situation before making a public announcement. Otasek *detests* violence."

"That's a good trait for the RIO commandant."

"That depends. A person who hates violence may be very reluctant to take action to prevent someone from being violent," Ali observed. "Commandant Otasek is likely to wait and hope the provocation will go away. He could wait too long. Rutledge won't let him . . . I hope." He watched the astrogation displays on the panel.

The computer was quietly working, reassuring us of the fact by continual status reports on peripheral displays. The space of the Earth-Moon system was full of moving objects. The ones of no concern to us were de-emphasized on the displays. There were military ships and stations and satellites among those targets, but nobody was shooting at anyone else. There was peace in space.

There wasn't peace on Earth. The comm/info net and the telenews broadcast a running stream of information on brushfire wars, guerrilla wars, terrorist raids, banditry, and piracy taking place all over the surface of the blue-and-white pie-in-the-sky in my left window. I remarked, "Too bad, isn't it, that fights take place Earthside where a lot of people get killed, rather than out here where very few people would get hurt?"

Ali shook his head. "No, if our forefathers had been smart, warfare would have stopped at the stratosphere. War is an uneconomical, inefficient, and temporary way of trying to get something."

"In the long run."

"There is no other."

"Convince the world of that."

"We will."

There was a message waiting for Ali when we got into the ComSpat module. He scanned the hard copy, then said, "Dirtside wants a telecon. But why call it with hard copy?"

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"What does the hard copy say?" I asked.

"Didn't specify."

"How was it signed?"

"Just Vamori, Landlimo Corp."

"Which Vamori?"

"Again, no indication. Let's call the troops together."

But Ursila was out-base on a run to Dianaport for a load of acceleration-sensitive blood fractions that couldn't be tossed by a mass driver, and Omer was about to land the *Toreva* at Vamori Free Space Port. Tsaya wouldn't release The General to the ComSpat module yet, and there was no way to a conference circuit into the clinic because a secure scramble couldn't be assured with a remote through the clinic's facilities.

Ali sighed. "I don't know what this is all about, anyway. Thirty seconds. Okay, Jeri, punch up the net for us."

The only person on the net Earthside was Ali's father, Rayo Vamori, who looked stern. "I need to speak to Ali. The rest of you may go, and my apologies if I took you away from something important."

Ali scribbled on a note pad which he slipped unobtrusively to me. His note told us to get out of video range and stay silent. We did.

When it appeared to Rayo Vamori that the conference room was clear, he said to his son, "We need your grandfather here immediately."

Ali shook his head. "Tsaya won't let him travel yet, Father."

"How long?"

"A week perhaps."

"Too long."

"Sandy Baldwin is Grandfather's military deputy."

"Baldwin isn't fully committed and doesn't have a depth of knowledge of the Commonwealth."

"If you want military advice, call in the indunos of the impys."

"They're too close to their own military problems to grasp the overall picture. On the other hand, we aren't military people and don't have the background to handle some of the problems facing us."

"Then you have no choice but to accept his deputy. I'll certainly vouch for Sandy," Ali said.

There was silence on the net for a moment. Finally, Ali's father spoke up again. "Very well, but to supplement Baldwin's expertise, we'll need your background in our space operations. Come to Vershatets immediately."

"Father! The RIO matter is critical at the moment! I *must* stay here!"

"I can't explain, Ali. In any organization, requests can be discussed, but direct orders must be followed. This is a direct order. The *Tonolia* undocks in two hours, and you will be aboard her. There is no further discussion. I will see you after the *Tonolia* grounds."

And without another word, the circuit was cut from Earthside.

Ali was livid. "I'm not going!" he exploded.

I moved to his side. "Ali, I think you'd better."

"Why?"

"Has your father ever given you such a direct order?"

"Once, many years ago when both Vaivan and I were seven, we decided we had the right to run our own lives and refused to go to bed one night."

"That was a long time ago under dif-

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ferent conditions," I pointed out. "We'd better see what your father wants that's so important he'd act as he did. Bump the *Tonolia*'s co-pilot, and I'll bump the pilot. We'll go down together."

"I'm not going."

"I'm not totally familiar with your Commonwealth customs yet, and certainly not with your family ways, but if your father has never given you such a direct order as an adult, there's something going on that he can't tell you even on a scrambled link. Whatever it is, it's important. Stop being your usual stubborn self, Ali, and realize your father's at least as smart as you are. He wants you Earthside." I added, "Don't forget: this is war."

There was no such thing as an overall Space Traffic Control authority in those days. Each space-faring nation had its own STC Center to handle ships that entered its "official" national airspace at 100 kilometers' altitude. International agreements had extended the authorities of these national STCs upward through the low-Earth-orbit zone to 25,000 kilometers. Geosynchronous orbit was in turn controlled by other national STCs located in GEO, and their volumes of authority were determined by other international agreements because various nations had "preferred locations" for their metsats, comsats, and powersats. Beyond GEO, three other STCs controlled 60-degree sectors centering at L-5, the Soviet L-4 sector, and the Lunar STC Center at Dianaport, which was operated internationally.

Threading one's way through this maze made space flight a challenge, because it seems there's always some person/computer who doesn't get the word. The system works 99.9 percent of the time, but there isn't a military or civilian space jock who hasn't tangled with the "Tenth-percent Law" at least once.

Given the situation—the Commonwealth and about twenty other small nations telling the rest to stuff it up their nozzles with a purge pipe—the system was suddenly very sporty. Everybody operated exactly and precisely according to their version of the book. No matter what the system or device is, if it's run by the book or the rules all the time it'll become so confused it's worse than no system at all, or it'll bend something.

Our undocking from L-5 went on schedule. Then the computer cleared us to Dianaport instead of Vamori-Free. "Computer error." We hung dead in space for forty-two minutes until the computer system found a slot for us. Eurosynch Center claimed our beacon was faulty when we entered their sector and made us change codes. But the temporary code wasn't communicated to StarBase One Center in LEO, and we were verbally challenged by AmSpace Command as an intruder when we were handed off. We got that straightened out. Wichita Center vectored us into a 200-kilometer inclined holding orbit because of outbound traffic from Guyana, but the orbit was phased so we had to either expend a lot of delta-vee to get to Vamori-Free or wait for six orbits. We elected to expend the propellant, which in turn put us in a non-standard approach.

This grand tour was topped by the fact that nobody told Vamori STC Cen-

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ter or Vamori Approach that we were coming. Vamori Approach cleared the *Tonolia* for landing on Runway Nine-zero, Area Seven-three, a non-standard approach which took us through the airspace of Malidok, who didn't appreciate unanticipated passage through their airspace. I think they shot an ASAT and missed, but I don't remember because Ali and I were busy flying the screwed-up approach. The autopilot flew the ship to landing system capture, but I had to take it the rest of the way manually and visually. Something was interfering with the landing beam. After all we'd been through, landing the *Tonolia* on Runway Nine-zero was a piece of cake.

The area boss driving the pickup van reported, "There's an aerodyne waiting for you, Alichin. You're to go directly to Vicrik."

Ali looked at me. "You're right, Sandy. Something's afoot."

"Quite so, Watson," I replied, mimicking Peter Rutledge.

"Want to fly?" Ali asked as we debouched at the waiting aerodyne.

"I've had all I can hack today. You fly. I'll cheer."

Ali settled in, powered up, and called traffic control. "Vamori Departure, Victor Mike Charlie Seven Zero Whiskey, Area Seven-three, ready for departure, request Airway Ten to Vicrik. And will you give me the latest Vicrik hourly sequence, please?"

"Victor Mike Charlie Seven Zero Whiskey, this is Vamori Departure. Vicrik reporting one thousand broken, ten thousand high thin scattered, wind zero eight zero at one five. Caution advised for moderate to severe icing on the eastern slopes of the Dilkons at three thousand and above. Lenticular clouds reported over the ridges. Mountain peaks may be obscured. Intermittent light rain in the Vicrik and Dekhar areas. Ready for clearance?"

"Typical March weather," Ali muttered and replied, "Seven Zero Whiskey, ready to copy."

The clearance appeared on the display. "Departure, Seven Zero Whiskey, query," Ali transmitted. "We show cleared Airway Ten, Oidak, Airway Fourteen, Dekhar, Airway Eight, Vicrik. Why the deviation?"

Pause. "Oidak Center says take it or leave it."

"Cancel! We'll go visual Airway Ten direct Vicrik!" Ali snapped, obviously angry. I was perplexed, too, because I'd *never* had any clearance offered take-it-or-leave-it.

"We don't advise that, sir. Aeronote Delta Seven restricts uncleared flight within twenty-five kilometers of the Oidak rectenna. Uncleared aircraft will be intercepted."

"Ali," I said, "take the clearance. Sounds like the Commonwealth's on alert status. We'll find out when we get to Vicrik. Let's get there and bitch later."

He sighed. "Departure, Seven Zero Whiskey confirms and accepts clearance."

"Roger. Seven Zero Whiskey cleared for lift, climb, and maintain five thousand, heading two-one-zero to join Airway Ten."

Earth has something that space does not: weather. It was a cruddy day in the Commonwealth. We popped out of scattered clouds at two thousand meters.

"Typical spring weather," Ali re-

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marked. "The intertropical convergence zone starts shifting north about March first and the South African thermal low breaks down. Northerly winds aloft shift anticlockwise until they're southwesterly in June. This time of year we get a shear line with moisture pumped up the eastern slopes of the Dilkons. Our rainy season. Lasts about three Krick cycles until the summer pattern becomes established. Things will begin to get nice again in May. But we need the rain to keep our impoundment reservoirs full for the irrigation net. We get three growing seasons because of it."

The flat Toak Plains below us were partially hidden by a broken layer of low clouds. Our flight plan took us over seemingly endless kilometers of lush farmland until I saw the broad, gleaming expanse of the Commonwealth's powersat rectenna a few kilometers beyond the city of Oidak. Following flight plan, we swung north along Oidak Lake and up the valley of the Dekhar River, turned southward at Dekhar Nav, and made a bumpy let-down through the broken clouds into the high Vicrik Valley.

Even with the lousy weather, the Vicrik Valley was verdantly gorgeous. Some 2,500 meters above sea level, it was surrounded on the east, south, and west by mountains soaring up to 4,000 meters. Towering over Vicrik on the west were the jagged spires of Mount Doradun, its treeless summit poking through the cloud decks into the sunlight. The town of Vicrik was on the southeast shore of a man-made lake that filled a large portion of the valley. This was a major Commonwealth resource area because I spotted power lines, hydro plants, railways, mine tipples, saw mills, and paper mills. It was also one of the best winter sports areas in the world.

Ali took manual control and flew to where a cluster of buildings was visible up against a granite massif. "Vershatets," Ali pointed. "Old word meaning 'mountain keep' or 'castle.' Emergency headquarters for every Commonwealth firm. Portions are leased to Commonwealth Defense as a first-line command post."

"Ali, there aren't enough buildings for that," I said as he set the aerodyne down on a landing stage.

"They took three billion tallys of gold out of this mountain before the lode petered out. There's more than a hundred kilometers of tunnels under there."

Vaivan was waiting for us. She and Ali embraced. I would have liked to, because in the two months we'd been gone Vaivan hadn't lost a bit of her sensuality. I had to be satisfied with a friendly hand touch.

"Where's Father?" was Ali's first question. "I want to get this matter settled right now!"

"Ali," she said in a comforting tone as we quickly walked off the landing stage in the cold drizzle, "didn't you recognize that as an excuse to get you here?"

"Sandy had some suspicions along that line," Ali admitted as we reached the covered verandah of a wood-sheathed house. "We knew something was going on when we were steered all over the countryside from Vamori-Free."

Vaivan smiled. "Sorry. I took the precaution of getting Induno Dati of the

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AirImpy to issue flight restrictions and clear you in via the north approach. Anybody tracking your beacon with a hand-held unit at Vamori-Free would have seen you disappear up the Dekhar Valley in the direction of the Saddleback Recreational Area, where we've established a dummy control post. I want to be as devious as possible about what we're doing and where we are right now."

"Vaivan, we could have been tracked from orbit," I told her.

"Not into the Vicrik Valley," she said. "There are four mountain peaks around us with summits above four thousand meters and with particle beam generators on them. Hydro power runs them, and they create a layer of partly ionized air of higher dielectric constant over Vicrik Valley. That doesn't hide anything from infrared sensors, but it certainly makes it very difficult for anybody in orbit to keep radar on anything flying in or out of here. Right?"

She was. The United States Aerospace Force had a similar radar-smeared installation at Tincup in Colorado's Taylor Basin.

We settled around a table in the warm front room. It seemed strange to sit at a table again. There were hot cups of *chai* for us. It must have had some *supaku* in it because it warmed me as it went down, then sat in my belly radiating heat into the rest of my body.

Vaivan explained, "Ali, we had to get you and Sandy back here in spite of the urgency of the RIO operation. We urgently needed a critical planning meeting."

"But why must we be here in person? We've got a scrambled telecon net."

"The scramble code's been broken."

Ali sounded incredulous. "But it's so complex that nothing can crack it."

"It was cracked. Our telecon net is no longer secure."

"Vaivan," I put in, "it was an inside job. A complex code can be cracked only by compromise. Someone dump-copied or modemed the computer memory."

"I think that's what happened."

"Who?"

"I don't know. But since we know the net's not secure, and since they don't know that we know, we can use it to provide some misdirection and false data," Vaivan replied. "In the meantime, we have no secure comm until we get the new lasercom installed, and that means face-to-face meetings."

"Anybody working on a new code program yet?" Ali asked.

"That takes time we haven't got."

"Look, what's the best code in the world?" I put in.

"There's no unbreakable code," Vaivan said.

"That isn't what I asked. I'll answer my own question: The best code is one nobody knows is a code. If we come up with another scramble code, it'll get compromised the same way. How much commercial comm traffic goes on in the Commonwealth?"

Ali whistled. "I don't know the exact number, but there must be over five hundred thousand voice channels along with thousands of wide-band video, video-holo, and data exchange channels."

"How many people would it take to monitor all of it?" I persisted.

"Several thousand at least."

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"Co-ordinating that effort would be extremely difficult, wouldn't it?"

Vaivan nodded, her shoulder-length hair bouncing across the scarf pulled over her shoulders against the cool mountain air. "And every monitored channel would have to be screened to determine whether it contained any important information. Then that would have to be evaluated. It's a massive effort too expensive and time-consuming to be considered."

"So we use ordinary commercial telecom in the clear. Each day, use a different channel determined by a computer's random-number generator. The information about the next channel will be passed along each day as a password," I explained.

"Password? That's ancient technology!" Vaivan objected.

"It works."

"Not if the spy knows the password."

I shrugged. "So the password must be known only by a few. Vaivan, you're the one to select those people. Don't make the list too long. Also set up a second list, and we'll use that to trap our spy."

"Nice move," Ali commented.

"In the meantime, we'll keep fake telecons going on the compromised net; we don't want to reveal we know they've broken our code. Teleconferencing in the clear need be known *only* to those with the password; let everyone else believe it's being scrambled."

"It won't work forever," Vaivan said.

"What does? And it doesn't have to," I told her. "This situation is going to come to a head soon. Look, even if they discover we're teleconferencing in the clear, they'll have to monitor thousands of channels. They'll have to know the modulation characteristics. We can drive their monitors absolutely nuts!"

About two hours after we arrived the weather cleared, and it was the sort of bright, clear day that reminded me of springtime in the Rockies and the glorious breaking of winter's grip on the Rampart Range above the Academy. I wanted to get out and utilize the walking muscles that had been so useless at L-5. But I didn't get the chance. I found myself with hundreds of meters of rock above and around me in the heart of Vershatets and seated in the conference room of the Commonwealth Commerce Council, called "C-cubed" in the vernacular.

Vershatets was more than Cheyenne Mountain or Tincup. It was used by commercial firms as well as by the defense forces. If a time came when military action arose against the Commonwealth, business had to go on and the Commonwealth continue to function. If Topawa, Oidak, Manitu, Hitason, or any of the other commercial/industrial centers were damaged—it had been accepted for over a century that the Trenchard area-bombing doctrine combined with nuclear explosives made such centers prime targets—the commercial/ industrial leadership had to be as secure and continuous in operation as the military leadership.

Most business affairs were conducted in Topawa. Trusted friends of Commonwealth businesses might be entertained and negotiated with in Vicrik, but no outlanders saw Vershatets.

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C-cubed was the big-time in the Commonwealth. The top people in the Commonwealth, all CEOs of their respective organizations, were in that underground conference room. This time I recognized most of them; I'd met them at Karederu Center the night it burned:

Shaiko Chuili Stoak, Tsaya's father and CEO of Commonwealth Glaser Space Power Corporation.

Ali's father, Rayo Sabinos Vamori, ComSpat.

Landlimo's CEO and Vaivan's husband, Wahak Gramo Teaq.

Marcu Sanostu Sabinos of Commonwealth Space Services Corporation —ComServ.

The pudgy Kariander Kokat Dok of the Topawa Finance and Investment Company with his counterpart from the Commonwealth Bancorp, Tonol Dok Kokat.

Donalo Jon Tomason, head of Rose & Mariyama, Inc., the engineering and construction firm.

Heinrich von Undine, representing Chiawuli International Factors and Underwriters, Limited.

The beautiful Prime Manager of the Vamori Free Space Port, Vaya Volkatu Delkot.

Two other Commonwealth women graced the Directors' meeting—Emika Vaspua Kom, who ran the Pitoika Sea Port, Drydock, and Ship Company, and Nanya Liputa Tahat, head of Commonwealth Tourism, Inc. or ComTour, the biggest firm in the huge Commonwealth tourist industry.

"What's The General's role in this?" I asked Ali as we took our seats around the huge circular table.

"He's chairman of C-Cubed."

I lifted my hand. "Ali, I can't run this meeting as The General's deputy! I don't even know what the agenda is."

"You're his military deputy. My father's his commercial deputy. So comment if you wish."

Rayo Vamori began the meeting. "Our purpose today is to bring us all up to date on what's transpired in the past twenty-four hours and to make the necessary decisions required to proceed with Phase Three."

Kariander Dok broke in, "Rayo, it's rather unusual that our associate advisors from out-country aren't on the screens."

"We have some communications problems." Rayo Vamori didn't reveal that the scramble code had been broken. "If we need to talk to Mukhalla, Phalonagri, Chung, or Sinclair, we'll get them on the line."

We'd decided we'd use teleconferencing in the clear if absolutely necessary; the passwords had been disseminated by courier. But Vaivan didn't want to do it extensively. Since we didn't know whether or not somebody in C-Cubed was leaking information, the meeting was being videotaped unbeknownst to the participants. Later Vaivan's experts would edit it, insert false information, and squirt it out on the scrambled telecon net just to keep up the charade that we didn't know we'd been compromised.

"Shaiko, will you bring us up to date on the powersat situation, please?" Rayo said to the tall man on his right.

"InPowSat, InSolSat, and PowerSat intend to shut down the additional power beams as they've threatened," the Commonwealth Glaser CEO reported. "I've

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offered Hong Kong a split beam on a temporary basis provided they'd come up with the capital through the Chungs for R-and-M to build a dedicated powersat for the Hong Kong complex."

"Pardon me," Kariander Dok interrupted, "but I haven't been advised of this. Anything that's done out-country should by rights go through Chiawuli . . ."

"And ComBank," Tonol Kokat added.

"You'll get your usual percentage," Shaiko told them.

"Shaiko, let us handle this with Wenling Chung," Kariander pleaded. "We can smooth the way for much of the international fund transfers, for example . . ."

"Chung insists. The capital sources who've come to him to finance their powersats wish to deal through Chung directly with R-and-M."

"Isn't that rather unusual?" asked Tonol Kokat.

Shaiko shook his head. "These are unusual times, Tonol. Let me finish my report." He held up sheets of hard copies. "Wen-Ling just informed me that we got more than we bargained for. The government of Ch'ien has authorized the Chung bankers in Hong Kong to request bids on three powersats."

He was talking about the government of mainland China. The Chinese were still fiddling around with their spelling then. China was called "Ch'ien" and most of their city and province names had changed, too. The prime benefit of their ideographic writing was that an ideograph meant the same everywhere in the country, regardless of the local dialect. But any script with more than 50,000 characters was incompatible with the WSICI code and machine instructions with which the rest of the world communicated. Part of the inscrutability of the Yellow Peril was due to their incompatible writing.

The Chinese penchant for doing things in old and established ways was obvious in their preference for carrying out their large international dealings through the Hong Kong financial institutions. Although the British treaty with China had long lapsed and Hong Kong was then a Crown Colony in name only, it was an extremely convenient doorway. With their mass of people, the Chinese government wasn't yet able to establish a national policy of free enterprise and a free market; it would take several more decades of mass education through the comm/info network before the Chinese would be able to catch up to the rest of the world in the basic education it takes to make a free system work.

"How can they pay for them?" von Undine asked.

"They've got the up-front money from their petro reserves," said Don Tomason of the engineering firm, referring to the fact that at that time China produced far more petroleum and natural gas than even the old OPEC nations at their height. "We can get started almost at once, Heinrich. Those three powersats can be on line in six months with ComServ supplying the lunar materials, ComSpat getting them from Luna to geosynch, R-and-M putting the powersats together, and Commonwealth Glaser operating them under contract. Tonol, you're our banker. Heinrich, the critical high-tech components will come

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through Chiawuli International. Sweet deal all around."

"Are those the Chinese bid requests?" von Undine asked Shaiko Stoak, indicating the hard copies.

"Yes."

"Are we being sole-sourced?"

"As far as I know."

"Shaiko, please find out. Get Sinclair on the line."

Shaiko made up an excuse. "Our scrambler's out, Heinrich. Want to discuss this matter in the clear on an unmonitored channel?"

"How soon before we can use the scrambled channel?"

"Wahak?"

The chief of Landlimo Corporation replied carefully, "I'll check."

"Soon, please."

Wahak looked over at his wife. "Vaivan, telecon net status, please?"

There was a moment's hesitation while Vaivan consulted a VDT. "Vaka is up and available," she replied. She was using one of the Esperanto passwords, indicating to Wahak, Ali, and me that she didn't want to use the normal scrambled channel but had an in-the-clear channel ready.

Skinner Sinclair looked like he'd just gotten out of bed, which he had. He didn't complain about the time differential, but was his usual well-controlled self.

"The courier brought me the hard copy," Sinclair said. "Looks good, Shaiko. Why'd you call?"

"We think we're sole-source, but we wanted to check."

"We are, but I found out at a Shelco-Phelps party tonight that there will be another bidder in spite of it."

"What? On a sole-sourced RFQ? Who?"

"The Socialist Hegemony. More specifically, the Soviet Union."

Don Tomason piped up, "What's their bid?"

"Far above anything we can match," Sinclair reported, "but their terms may give us leverage."

"Let me guess," said Tonol Kokat of ComBank. "The Soviets own the powersats and lease them to China."

"You're close. Leaseback."

"Very interesting!" mused Kariander Dok. "The Soviets build the powersats and China pays for them. China then leases the powersats back and receives monthly rentals from the Soviets. But, in the meantime, China pays delivered power charges from powersats it already owns. Why? What advantages are there for both parties in that arrangement?"

"The only one I can see is that SovBank may loan China the up-front money at their usual percentage so China doesn't tie up capital it could use for other purposes," said Tonol Kokat.

"There's also a military reason," I interrupted. "Soviet thinking *always* considers military implications. The arrangement makes the powersats unavailable to China for military use. But the Chinese won't take the Soviet offer. They distrust the Russians—not the Soviets, but the Russians. There's a difference. And China hasn't forgotten who won Space War One."

Trip Sinclair went on, "Ladies and gentlemen, the Soviet offer is only one reaction to our powersat ploy. Rockland/Incomp/Philips/OffenhauserConsortCorp resurfaced yesterday. Good

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old Rip-Off is back in business. The word on the Street and in the Club indicates that Rip-Off intends to offer China a package of coal-fired plants."

"China hasn't got easily mined coal," Shaiko Stoak said.

"But the United States does," Trip reminded him. "Scrape it off the western desert, pump it as a slurry through a pipe to a tanker on the West Coast, then ship it across the Pacific. It's the modern version of the Orient trade."

"I'm not worried about American competition," said Don Tomason. "We'll offer non-polluting solar power without stack residues or problems with foreign resource allocations."

"Worry about it," Sinclair advised. "What's the design life of a powersat?"

"Fifty years, with updating."

"I understand a coal plant has the same," the Houston attorney said. "And in thirty years, the whole situation will change—politically, technologically, and economically. Rip-Off will offer a powersat follow-on option. Knowing them, it will be a refurbished powersat now on-line but life-cycled and uneconomical in hi-tech by 2070. Worry about the Rip-Off proposal, Don. The Tripartite has the financial clout to make it attractive to the Yellow Peril."

"And the Tripartite would just love to get the Yellow Peril locked in, wouldn't it?" muttered Shaiko Stoak of Commonwealth Glaser.

"Ladies and gentlemen, any suggested change resulting from this information?" asked Rayo.

"No," Don Tomason put in quickly. "We've thought this through carefully. This is no time to make changes."

"I don't like any financial arrangement that bypasses ComBank and Chiawuli International," Tonol Kokat objected.

Vaya Delkot snapped back, "Tonol, you're using scarcity-economics thinking again! Don't worry about your share. A dozen other low-tech countries will step up to get delivery positions on Commonwealth powersats when the word gets out, and you'll be involved."

I stood up to get and hold attention, a trick I'd learned in conducting Aerospace Force briefings. "Maybe I'm too locked into scarcity-economics thinking, but so are our adversaries. So I don't understand why you've convinced yourselves that the Tripartite *or* the Hegemony, real or not, would come head-to-head with you and not try to win by any means at their disposal. The Tripartite can't continue to pull plugs on small countries to whip them into line. When they see our reaction, they'll shift to other forms of coercion such as economic warfare."

"We're not vulnerable," Rayo Vamori countered. "We may lose some foreign trade with Tripartite organizations, but we'll pick up others who've never liked being Tripartite underlings."

"The Tripartite knows that," I said. "Our adversaries *aren't* stupid. They discovered we won't knuckle under, so they'll start to play rough. Are we ready to play rough, too?"

Shaiko Stoak said, "Sandy, we anticipated the possibility of military action against the Commonwealth. Defense plans and programs have considered all possible assaults that could be mounted by our neighbors."

"Or from space," Ali added.

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"There won't be any military activity for some time yet. The Tripartite hasn't exhausted its non-military options," Vaivan insisted.

"Suppose the Tripartite decides the options are invalid because of our response? Suppose they resort to armed conflict next?" I walked back around the table and resumed my seat. "They'll choose the time, place, and method, but they'll need a pretext. What do your plans say about where they'll create an incident?"

"They'll do it in space with powersats so it appears to be a military threat from the Commonwealth," Ali said firmly.

I shook my head. "No, that won't suit their purpose. It's remote from people. It will happen here on the ground where people will get killed and property damaged or destroyed, where telenews can cover it in all its gore, and where it can be made to look like we started it."

Kariander Dok laughed. "That's incredible! Why would we attack any Tripartite interests? *How* could we attack them?"

"We wouldn't attack, because it's contrary to the Commonwealth's basic principles," I countered, "but the rest of the world doesn't know because the rest of the world doesn't understand abundancy-economics. The next move of the Tripartite will be armed conflict fought on our territory to occupy the time and effort of our leadership and drain our resources away from any competitive powersat programs."

Again there was silence throughout the underground conference room. Finally Kariander Dok asked Shaiko, "What does General Vamori have to say about this?"

I was growing to dislike this big, fat man with his pudgy little face and supercilious manner. "The General's still recovering from his burns," I answered. "I'm his deputy."

"Why didn't The General deputize *you*, Alichin?" Tonol Kokat asked.

"Because Sandy's an educated professional military man and I'm not," Ali told him. "My expertise is in marketing and operating space activities, not war."

"Your grandfather was no military man when he beat Chase," Tonol pointed out.

"He didn't have Sandy Baldwin. We do."

"This man could be another Chase." Tonol Kokat kept the pressure on.

Ali came to his feet, his hand on the hilt of his still-scabbarded iklawa.

I knew a bit more about Commonwealth customs now. I was on my feet, too. I reached out and laid my left hand on Ali's shoulder. "Please, Ali. He didn't refer to you."

Ali shook his head. "No!" he spat out. There was fire in his eyes and I detected him shaking slightly.

I was trembling, too, but from adrenalin pumping through me. This was my first encounter in the Commonwealth, the first time someone had insulted me in public. It had been done at a very high level, so I had to follow through.

"Sandy, he implied that Landlimo Corporation—myself, in particular—brought you to the Commonwealth to lead a *coup!*" Alichin went on, breathing hard. "The privilege is mine!"

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Kokat had risen slowly to his feet, but his hand didn't drop to his iklawa. He was older than I. He would have been easy to take, but I hoped I wouldn't be forced to fight. I had to maintain a front, so I growled at him, "Tonol Kokat, I came to the Commonwealth in response to a call for help."

"Chase came as a mercenary."

"Chase was a looter!" Alichin said. "He came to help our forefathers put our own house in order. Sandy didn't. You don't know American military philosophy. Sandy's trained to take orders from civilians. He's doing the job we asked him to do. Retract your words, Kokat!"

Heinrich von Undine reached up and touched Kokat. "Tonol, my friend, the time isn't right. You have great responsibilities . . ."

"Yes, Tonol," Kariander Dok added. "And how long has it been since you've drawn? An apology wouldn't wound you as severely as Baldwin's iklawa. I am willing to believe you were reacting only to the possibility of someone repeating our great national trauma of fifty years past." Kariander Dok was a soothing arbitrator.

The banker looked around. His hand still hadn't touched his iklawa, which was ornamental. It was obvious he didn't have the support of those present, although protocol probably kept them from interfering. Kariander Dok may have acted on the very edge of propriety, but perhaps an attempt at arbitration was allowed.

Rayo Vamori broke the impasse. "Tonol, we have more important things to do. Our families and our nation take precedence. Would you withdraw your remark?" Vamori could well have taken issue himself. Everyone knew Rayo's son was part of Kokat's insinuation.

Tonol Kokat looked directly at me and, with a total absence of emotion in his voice, said, "I withdraw my remark but reserve the right to hold a private opinion until events either prove me right or wrong. If right, I'll take action to protect our families and our nation. If wrong, I'll apologize then." And he sat down.

I sat down, too, as did Ali.

I was astounded at my own actions. I'd never believed what my father believed. I'd let it all hang out as far as possible in the air and in space, and I'd even burned a Soviet. I didn't like one-on-one hand-to-hand. Yet I'd reacted to a personal challenge, had almost drawn my iklawa, and was strangely happy that nothing had happened. At twenty-eight years of age, was I beginning to show the inevitable signs of an aging tiger?

"Back to business," said Rayo Vamori. "Any comments?"

"Bid the Hong Kong deal," Vaya Delkot said.

"As low as possible," Wahak added.

"Underbid if we have to," said Shaiko.

Don Tomason objected. "Underbid it? We can't stay in business doing that! We'll lose money, and it can't be made up in volume."

"Yes, it can," Wahak said. "Our low bid will attract those who lost Tripartite space power. If we build twenty low-cost powersats to satisfy demand, that's cheaper than building five because we can spread fixed costs."

Emika Kom of the Pitoika Drydock and Ship Company put in, "Rayo, in

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view of what Sandy told us, he should get together with Defense Commissioner Hannu Abiku and his staff."

I never got out of the mountain that day. The next thing I knew Ali was guiding me through rock-lined corridors in an electric car to yet another excavated cavern that bore a sign over its entrance: "Commonwealth Defense Commission, Vershatets Redoubt Headquarters."

"It's about time," I said to Ali. "I should have come here earlier."

"When would that have been, Sandy? We took The General to Ell-Five the same day you arrived here, you've been on Earth once since on a down-and-back packet run, and we got here only hours ago."

Sometimes when things happen fast, I tend to forget simple sequences, to say nothing of time periods.

This conference room had a military feel. There was no round table where everyone sat as equals. There were six console desks facing a wall which had situation display screens and another console desk in front of it.

Six people followed us into the room. Five wore the first Commonwealth military uniforms I'd seen. Each uniform was slightly different.

Alichin performed the introductions.

Hannu Chuili Abiku wasn't in uniform. He was the Defense Commissioner directly responsible to President Conobabi Nogal.

The others were the commanders of the five impys or military services:

AirImpy Induno Tanana Pinala Dati must have been a fighter pilot because of her small size.

LandImpy Induno Nenana Husila Pahtu's necklace medallion told me she was a armor weaponeer.

CoastImpy Induno Naco Yumi Shokutu had classical naval shoulder boards of rank framing his otherwise broad shoulders; his sword didn't look out of place.

The uniform of SpacImpy Induno Eloy Minto Chervit followed the old tradition that military dress derives from battle gear; his flight suit was well tailored.

Induno Kivalina Soldata Moti was an older woman in charge of the Commonwealth's citizen reserve, the Cit-Impy of more than a million people.

Their introductory greetings were polite but curt. It was obvious they'd been called from their daily work for this impromptu meeting. Ali had undoubtedly used his grandfather's political clout.

They didn't waste any time, but sat down behind their console desks. The commissioner motioned Ali and me to the lectern in front of the wall display screens. "Alichin, this is your request. Please proceed."

Ali stepped to the lectern. "Thank you for taking the time from your schedules to meet with us. Induno Baldwin's vitae are available at your consoles. We've just come from a meeting of the C-Cubed directors, and here's the current situation."

Without visual aids, Alichin outlined the powersat and commercial-financial situation.

There was a VDT next to the offstage chair in which I sat. I queried the library computer. The rank of "induno" was that of a general officer, but there was

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only one General in the Commonwealth, the title now being the highest possible national honor.

"As a recently naturalized Commonwealth citizen, Induno Baldwin brings us a fresh, objective viewpoint," Ali went on following his situation briefing. "He believes we're faced with military action sooner than anticipated and in a different manner than previously considered. The C-Cubed directors believe this, too, which is why we're here. Sandy, take over."

Ali found a chair at one side of the room, leaving me the lectern.

I had no notes, no prepared briefing, and no visual aids.

One of my most valuable Academy courses had been a required three-credit seminar called "Briefings 301." It was known to be a nut-buster, but I'd loved it! At each class session, one cadet was chosen at random and given a situation whose data he could call up on his VDT. He had ten minutes to acquaint himself with the situation. Then he had to present a thirty-minute briefing to the class. Following this, he had to open the briefing to questions. If the briefer bobbled it, or if the class could find critical data that hadn't been included in the verbal briefing, the briefer "crashed and burned" for the day. The course taught me to think fast, talk convincingly, and *never* use the old adage, "If you can't convince them, confuse them."

I gave the Commonwealth's defense directorate the same basic pitch as I'd presented extemporaneously to the C-Cubed meeting. This time, I plugged some of the loopholes.

"I don't know your defense plans, although I've been told that some of my scenarios have come close to the mark," I concluded. "You undoubtedly know far more about the Commonwealth's vulnerabilities than I do. However, I'd *strongly* urge you to study these vulnerabilities *very* carefully with an eye toward someone creating an incident for which the Commonwealth can be blamed."

Induno Pahtu was one of those nonfeminine women who're hard as nails and look it. She wore her greying hair close-cropped, and her attitude was one of total professionalism. In a gravelly alto voice with just a hint of coarseness she replied, "My staff made a thorough investigation of our vulnerabilities to land offensives. Study Ganto Oro."

"Put it on the screen, Nenana," Commissioner Abiku told her.

A topo map of the Commonwealth formed on the screen behind me. I stepped to one side and looked.

"The classic historical avenues of attack are primarily along the coastal Toak Plains," Induno Pahtu said as two arrows appeared on the map. "Crossings of the Liupp River can be forced at several places. From the south, the Lipuputu River border is more difficult to cross because of its banks . . ."

"Excuse me." I don't usually interrupt generals during their briefings, but I felt I could get away with it here. "I wasn't speaking of overt invasions, Induno Pahtu. Nazi Germany started World War II with an invasion of Poland justified on the basis of a supposed Polish attack on a German border outpost —which was actually carried out with German soldiers in Polish uniforms fighting their own people. The Germans used it as a provocation to justify their

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invasion, which followed within hours. That was the sort of thing I had in mind."

Induno Pahtu shook her head. "No way it can happen. My troop concentrations are well back from our borders because I could move them rapidly by road and rail to prepared positions. There's a minimum garrison at Outpost Eight on the abandoned rail line into the Ilkan Empire, just to send them a message that we're ready if they should try to sweep southward. But that country's in a sad state."

"Induno, the terrorist who tried to kill me at Topawa Airport was Ilkan," Ali reminded her. "And Ilkans burned Karederu Center. They've apparently got the wherewithal to conduct terrorist operations in the Commonwealth."

"Internal counter-terrorist activity isn't my responsibility," Pahtu said testily.

"Induno Pahtu, with all due respect for the abilities of your staff," I put in, "the potential trouble points you've mentioned suffer from two problems."

"And they would be?"

"One: They're obvious. Two: They are not strategically important to anyone."

"They are certainly strategically important to me!"

"*But not to the Ilkans or the Chibkas!* Why would we attack either of them? According to the map, there's nothing the Ilkans have that we want. The same logic rules the Chibka front." I looked up at the display. "But there's a region that's bothered me ever since I first studied a Commonwealth map from a military viewpoint: the northwest corner of the Commonwealth."

"The provincial capital of Kulala," Induno Pahtu said, "is well garrisoned, and the Sayhuto Pass through the Dilkon Range is well defended."

"You're missing my point," I replied. I was crashing and burning this session of Briefing 301 in the real world. But I was talking to people who'd been living with the maps and the plans for years. "A major transportation route cuts across the northwest corner of the Commonwealth and goes through Kulala: the Rhodes Cape-to-Cairo Railway. I'll bet the Ilkans and the Emirate of Kalihol don't like it."

"You have a point, Sandy," Commissioner Abiku admitted. "That corner isn't ours by choice. It was part of the old Republic of Liupp that resulted from a Geneva conference seventy years ago. But we don't detain any rail traffic through there and we don't make customs inspections or charge duties; it's an open railway. It's important to us because our railway through Sayhuto Pass to Kulala connects to it, making it our major rail link to the interior."

Pahtu remarked, "I think you're wrong, but I'll listen to your analysis of the Kulala situation once you've been there. If you think the region's critically important, why don't you go for a look?"

I hesitated. I told myself that I should get back to L-5. If the balloon went up, my best position was in space, because that's where I knew how to fight best. "Ali?" I asked.

Ali shrugged. "They brought us down at a critical time, but I'm in touch with Peter. Two days won't make much difference."

"I'll take him by rail," CitImpy In-

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duno Moti offered. "The trip's spectacular."

"I'm not here to sightsee, Induno."

"True, but consider it part of your education in the military realities of the Commonwealth. I believe you've spotted a weak point, Baldwin. But you need to see it to be certain. With your background, I think your analysis could include a recommendation that might sway even Induno Pahtu. How about it, Nenana? May I use your railcar?"

There were only four of us aboard Induno Pahtu's Henschel rail car— myself; CitImpy Induno Kivalina Moti; her aide, ComExec Elwok Bylar Oraibu; and the white-turbaned, sport-shirted Sikh driver, Kirpal Sandhu Singh.

"It's a fine machine," Singh explained as we descended Dekhar Gorge. He was proud of his steed. In accordance with custom, two metal plates above the shovel nose and another inside above the windscreen announced Engineman Singh had named it *Allakaket Mountain*. The fittings had been polished and the bunker was wetted down. The steam plant was compact, using fluid-bed dual combustion and a twenty-atmosphere fire-tube boiler. There was no vibration from the opposed four-cylinder steam engine tucked underneath the front of the twenty-meter car. "It will take fifty tonnes over the pass to Kulala. But my normal run is Topawa-Oidak express passenger service."

"Isn't this Induno Pahtu's railcar?" I asked.

"The car's leased from ComTrans," Moti said from the left seat, viewing the rails sweeping in front of us down the gorge. "We also lease railway right-of-passage."

"I don't understand two things, Induno Moti."

"Call me Kivalina. What are they, Sandy?"

It didn't bother me to be on first-name basis; she was old enough to be my mother. "Why bother with rail? Aerodynes go anywhere and don't depend on right-of-way."

"It's a tactical mistake at any time to depend on one form of transportation." She pointed to the clouds scudding along the 3,500-meter peaks alongside the gorge. "We have two heavy weather seasons when air ops are difficult. Railways run in any weather and can be easily and quickly repaired."

I knew the military role railways had played for two centuries in a world that never stopped fighting. For hauling big loads of great weight, flanged wheels on rails can't be beat. "Sorry, I'm still using high-tech thinking."

"What's your second problem?"

"I can't figure out the Defense Commission."

"It's just a government subsidiary service corporation."

"How can the Commonwealth run the armed forces like a service corporation?"

"We got the idea from your country."

"Kivalina, the Department of Defense is one of the most inefficient tax-supported government organizations in the world!"

"I wasn't referring to DoD," Kivalina replied. "The United States has excellent, efficient, low-cost security systems that protect people, facilities,

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shipments, all the things armed forces should do. You've heard of Pinkerton's or Brinks'? Our Defense Commission is patterned after them. It doesn't have to make a profit, but it must be cost-effective. After all, it's a government business."

"A business? A government exists to create business entities, not to be one itself."

"Sandy, have you read our Constitution?"

"No."

"Well, you've got it backwards. A government provides definite services to both individuals and corporations. Ours is a non-distributive corporation, and every citizen or domestic company is a stockholder member. The annual membership charge for an individual is ridiculously low. That for a business is based on a small percentage of its capitalization—not costly enough to spend time and effort to avoid. One of the things the government handles is the common defense. There's no other way to do it."

I shook my head. "That doesn't make sense. A government performs social functions in addition to defense."

"Name ten 'government functions' that can't be done better by a private operation," she challenged. "If something's necessary and people are willing to pay for it, someone will risk capital and effort to do it."

"How about not-for-profit organizations?"

"Are there such things?"

"Sure. Service clubs and civic associations and the like."

"Oh, my, Sandy," Kivalina said with a frustrated tone in her voice. "An organization can't spend more than it gets. It must charge for value delivered. There has to be profit."

"The non-profit organizations I'm talking about don't distribute any monetary dividends to their members."

Kivalina brightened. "Those are non-distributive corporations. Singh's Engineman Sodality is one. He contributes regularly to it and it provides him with salary protection, medical care, and old-age benefits."

"That's a union."

"A sodality isn't a union. Individuals retain their own bargaining rights in a sodality."

"But that leads to worker exploitation!"

Kivalina advised, "Stop thinking in scarcity-economics terms, Sandy. Any organization that mistreats its workers can't stay in business. A disgruntled employee can form another company to do the same thing and treat its workers properly. Soon the original firm won't be able to compete because it won't have good workers. The same holds true for our defense forces. The CitImpy would be ineffectual if I depended on physical coercion. And they wouldn't have the sense of pride and tradition that's absolutely necessary to keep the CitImpy from becoming a revolutionary mob."

Every professional military officer in the world knew about the unique Commonwealth CitImpy. At eighteen years of age, everyone in the Commonwealth served nine months' active duty in training—including the handicapped, because there were support tasks they could perform. Each received a registered rifle and was responsible for its

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maintenance, use, and mis-use for life. But no American military officer entirely understood the Commonwealth system. "We've tried to get a militarily trained citizenry for almost three hundred years in the United States," I pointed out. "Americans won't buy universal military service. How'd you manage?"

Kivalina smiled. "Universal military training, not service. Defense of the social organization doesn't conflict with freedom. It's the duty of all members of a free institution to defend it. If you don't like it, you're free to find another one. It's a free country. . . ."

"Suppose I'm a young Commonwealther who refuses to participate?"

"You'd never become a citizen. You couldn't do things reserved for citizens. You couldn't vote. You couldn't join a sodality. You couldn't become a director or officer of any Commonwealth corporation. You couldn't open and maintain a bank account. You'd be legally a child. In other words, you'd be treated as a person who cannot accept responsibility for himself or his group." She looked like a wistful grandmother for a moment, then went on, "Can you accept total responsibility for yourself and your actions, Sandy? Some outlanders can't."

We emerged from Dekhar Gorge through forests of lianas and heaths and skirted the northern marge of Lake Oidak past the SPS rectenna. Two hours out of Vicrik we entered Oidak, the Queen City of the Toak Plains. Singh topped coal and water. "It is 570 kilometers to Kulala over steep grades," he said. "I must re-water at Sayhuto Pass, although the *Allakaket Mountain* reuses her feed water ten times."

Departing Oidak, *Allakaket Mountain* sped northward along the Oidak River. The Toak Plains, once a savannah nurtured only by twice-yearly rains, were a carpet of irrigated farmland. We raced past kilometers of hypergrain wheat, millet, soybean, and cotton fields. As we left the river valley and paralleled the Dilkon Range, the land became grassy steppe. The railway turned westward toward the Dilkons, and we started to gain altitude.

It seemed impossible that a railway could breach the mountains ahead. The grade became steeper and *Allakaket Mountain* slowed to a creeping 100 kilometers per hour as the railway climbed the gorge and hung on the side of the cliffs over the churning white water of the Sayhuto River below. Into the clouds we went, then out into bright mountain sunlight. It would have been impossible to put a 1.44-meter railway across these mountains; the gradients and curvatures taxed even the Commonwealth 1.07-meter gauge. Tunnel, bridge, fill, cut — the Sayhuto Pass Railway had to be unrivalled since the days of the Colorado narrow-gauge.

At about 2,500 meters it began to snow lightly, coating the heaths and fern trees with a dusting of white. But *Allakaket Mountain* whined ahead, the rails guiding it through the snow.

At the summit of Sayhuto Pass Singh stopped in a small railway yard with locomotive re-watering facilities near a cold-looking village of less than a hundred people. It was below zero Celsius, but there was no snow on the ground. The tops of the Dilkons poked

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out of the cloud deck, turning the peaks into islands in a sea of white. The trees looked like pines but weren't; some were stunted by the cold. The fern trees were also smaller with a dried, brown, dessicated look. Kivalina stayed in the warmth of the railcar. I quickly got chilled and went back inside, leaving Singh to oversee re-watering.

I looked at the tree-covered mountain slopes. "If the Dilkon passes are fortified, you've done a good camouflage job," I complimented her.

"Nothing I-R couldn't spot, but sometimes you have to get a visual to discriminate a target out of clutter," Kivalina remarked and pointed out the window toward the tree-covered mountainside. "Rocket and artillery batteries sweep both the railway and the highway. You wouldn't believe the antipersonnel booby traps out there. The terrain's impassable except to mountain ranger troops—and neither the Ilkans nor the Kalihols have them."

"They could hire mercenaries," I pointed out.

"Mercenaries often don't fight well when the going gets deadly."

As we talked, the sun disappeared behind clouds. Thunder reverberated over Sayhuto Pass. When we left ten minutes later, the visibility was nearly zero in freezing drizzle.

The western side of Sayhuto Pass was steeper, the curves tighter, the tunnels longer, and the bridged canyons deeper and more numerous. We went in and out of clouds, mist, snow showers, sleet, drizzle, fog, and warm sunlight.

The culmination of the dream of Cecil J. Rhodes, the Cape-to-Cairo Railway had been routed along the eastern and southern shores of Lake Nyira a hundred and fifty years ago with dynamite and hand labor. Kulala was a point from which the Germans blasted the Sayhuto Pass Railway through to the coast.

Twenty klicks out of Kulala we pulled into a passing track. A few minutes later a goods train went by up Sayhuto Pass. Singh came back from the cab with a concerned look on his face.

"Induno Moti," he reported, "something's wrong. Those were Rhodes Railways Diesels. The brake van was also Rhodes. The consist was reefers, grain gondolas, and livestock wagons. Down goods trains never carry food from Kulala." The Sikh was obviously disturbed at this unusual operation on the railways that were his life work.

Kivalina asked, "What does Kulala Despatch say?"

"I received orders from them to cross the train here and to proceed after crossing. I reported the crossing and everything appears to be normal."

"Proceed then, Mister Singh."

"Hijacked food train," I said, "with an Ilkan crew looking like Commonwealthers."

"No, probably Kalihol troops," Kivalina corrected. "The food trains go northbound from the Emirate to the Ilkans who can't feed themselves."

This was the incident I'd forecast! It would be made to look like the Commonwealthers had diverted a food train passing through their territory destined to feed the starving people of the Ilkan Empire. "Kivalina, if this isn't the opening move in a brush-fire war, it's certainly a preliminary."

She nodded. As the railcar moved off the siding, Kivalina and Oraibu opened

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a cabinet in the galley. She handed me a rifle and a bandolier of ammunition.

I looked it over. At the Academy, I'd studied every known weapon except this one. "Arisaka assault rifle," I said.

"No, Commonwealth AR-3, our version of the Israeli copy of the Arisaka," Kivalina said. "Same basic Arisaka action, almost impossible to jam, can be freed up by spitting on it. Seven-point-six millimeter high-velocity directionally solidified round, fifty to a clip. It'll take the head off a man at a hundred meters or blow his guts out."

Now I knew how it worked and what it would do, because of the weapons it had been derived from. It had hitting power designed to take an enemy permanently out of action. Its 2.5-kilogram weight came from extensive use of high-stress composites, and the recoil of the high-velocity round was absorbed by gas cushion and venting. The Arisaka could be dragged through sand, dunked in mud, used to hammer tent stakes, and never cleaned. It would work perfectly years after being so abused, and it would keep on working. It was the ultimate soldier's firearm.

Kivalina checked hers. "It's the CitImpy rifle and the ammunition is everywhere."

"How many murders are committed with these every year?"

"None. It's too big for a social purpose weapon. The penalty for misuse is the public gallows, leaving the murderer's family the burden and shame of paying the debts, obligations, and family support of the murdered." Kivalina slung the AR-3 over her left shoulder and the bandolier over her right. "Load and lock," she ordered. "I'll bet there's trouble at Kulala Despatch."

She stepped over to another cabinet that housed military comm gear. A few minutes later, she closed it. "Electronic countermeasures. But we'll beat that game."

She had Singh stop the railcar about five kilometers from where Kulala lay sleepily on the edge of Lake Nyira. Oraibu and I went with her back along the track to what appeared to be a signal box. Lifting the cover revealed a mike and a speaker. "As I said, Sandy," said Kivalina, pulling out the equipment, "any military organization that relies on a single technology is out of business in the opening minutes of any fracas. To satisfy your curiosity, opticom cables are buried under our railways. If they get cut, we have an I-R lasercom with relays on most of the Dilkon summits." Kivalina then spoke into the mike. "Tondro Six, this is Onklino One, do you read?"

"Onklino One, this is Malmola Lead! Where are you? We've been trying to contact you for an hour!" I recognized Induno Pahtu's gravelly voice. The circuit was all the way through to the Vershatets Headquarters.

"We're five from destination," Kivalina replied.

"There's a down goods train from Kulala. Stop it."

"Too late. It passed us ten minutes ago. It can be stopped at Sayhuto Pass."

"We don't think it'll get there," Induno Pahtu's voice came through again. "We're on lasercom and opticom to Kulala garrison. Kulala Despatch was overrun by people with CitImpy brassards who diverted an up food train to

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Ilkan with a Kalihol crew aboard. Get to Kulala, assess the situation, and report."

"Will do. Put the CitImpy units in Kulala district on Alert Plan Domo, units report to assembly points."

By the time we got back to the railcar, the sun was obscured by heavy clouds and rain had started to fall.

Kivalina ordered Singh to proceed into the Kulala marshalling yard at reduced speed. She and Oraibu slipped bright orange brassards over their left arms. She handed me one. "Put it on so you wan't get shot at. Under Plan Domo, CitImpy's identified by orange brassards."

The railcar shuddered to a stop.

We went up to the cab to find out what was going on. A bright red double signal light glared down the rain-slick track. Singh explained apologetically, "I cannot pass a double red."

Kivalina snapped, "Emergency override! Proceed at cautious speed. The terrorists in Kulala Despatch probably set the signals against arrivals. Sandy, take the right cab door and cover. Elwok, take the left."

In the rain and deepening dusk I couldn't see anything beyond a hundred meters. Huts and fences clustered along the right of way. Domestic animals huddled under shelter. Nobody was out in the rain, which was now falling heavily. I spotted the yard limit sign. The single track became a network of crossovers.

The railcar's headlamp went out with the unmistakable splat of a bullet's shock wave.

I was thrown forward as Singh applied emergency brakes. Swinging the bottom half of the door inward, I dropped to the deck plates.

Almost immediately, automatic weapon fire raked the railcar. I heard the sound of a body falling to the deck.

Over the sighing of the railcar, I heard sporadic rifle fire ahead. There wasn't anything to shoot at in the gloom. I wanted an I-R scope on my AR-3.

A wet hand touched my leg and Kivalina crawled into the doorway next to me. Her hand and arm weren't wet with rain but with blood.

"Despatch signals control tower is about two hundred meters ahead," she breathed. "They've got us ranged from there. We've got to get out of here."

"You're hit."

"Just cuts from pieces of windscreen glass. I put up my arm to protect my face," she said curtly. "I'll bandage my arm after we get out of this death trap. Let's go for that coaling bunker about twenty meters to the right. Give me covering fire. I'll go first. Then Sandy. Then Elwok."

"What about Singh?" I wanted to know.

"He died at his railcar controls," Kivalina said with no trace of emotion in her voice. "Cover me!" She dropped to the ground and ran hunched through the gloom toward a coal bunker. She drew no fire, so neither Elwok nor I shot back.

Then it was my turn. I dropped the meter to the ground, landing on the sharp ballast rocks. That was the easy part. The ground between the tracks was a morass of gluey mud that sucked at my feet. I drew fire. I *hate* mud and the sound of high-velocity rounds whiffling past. I heard covering fire from Kivalina

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and Elwok. I didn't think I would ever get to the bunker whose mass of coal was more than adequate protection against anything except mortar fire.

Kivalina was shooting around a corner near the ground. "Eleven o'clock, two hundred meters, about four meters up," she gasped, still out of breath.

We should have run for it together. Kivalina's break had identified a target. I gave them the range. They dropped Elwok.

The rainy dusk of the marshalling yard was suddenly lit by *Alfakaket Mountain* blowing up. A round found her boiler. The coal gas from the fluid-bed combustor created a fireball. Pieces of glowing coal were flung outward in the violent disintegration of the railcar.

In the flare of light from Engineman Kirpal Sandhu Singh's funeral pyre, I clearly saw the Kulala Despatch control tower.

And I could see how to get to it.

So I yelled at Kivalina, "Keep shooting! I'm going around to the right behind the sheds and clean out the tower building."

Blood was all over her now. "Don't do it! We don't know where the garrison troops are and when they'll attack!"

"From the looks of things, they don't even have the building under fire," I said. "One grenade will take care of that second floor."

"And disable all the railway control and switching circuitry! You'll put the railway out of action for weeks!"

"Then how the hell can we flush them out of there?"

"I don't know. Wait and see what the LandImpy does. Stay here. The area's full of CitImpy. You'll get shot."

I really didn't want to stay pinned down behind a coal bunker in the pouring rain with a wounded woman all night.

I'd been a passive participant in Commonwealth affairs long enough. "Someone has to do something. The terrorists in the tower can wreck everything there anyway, and the Commonwealth will catch the blame regardless. I'm going to clean out that tower."

"Don't shoot at orange brassards!"

"I'll shoot anyone who shoots at me!" I told her and dashed across five meters of open area to a shed.

I slowly worked my way to within fifteen meters of the control tower. As I was sizing up the stairway on the north side of the tower, a bullet smacked the bricks above my head. I reacted by swinging in a crouching turn, my AR-3 bucking against my hip. In the alley between two buildings, a form became a rag doll thrown violently backwards. Someone else stepped out, rifle at the ready. He got off two wild shots before I hit him, too.

"Cease fire, you trigger-happy Cit-Impys!" came a yell. "The enemy's in the tower, not down here!" A helmeted man stuck his head over a window sill. "Plan code password!"

"Plan Domo!" I called.

"Domo it is!" A uniformed warrior stepped out of a doorway while someone else pinned me in the beam of a spot light. "Orange brassard!" he confirmed.

In a few seconds, I was surrounded by LandImpy warriors. These were the men I needed to do the job.

"Induno Baldwin from Vershatets," I identified myself and took command

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whether I was supposed to or not. "CitImpy Induno Moti's wounded behind the coal bunker back there. You: get a medic and help her. The rest of us are going to clean out that tower. You and you and you: up the ladder to the roof of that shed. When you see me start up the stairway, put covering fire into those upper windows . . . *but don't hit me!* The rest of you, follow me. Move out!"

I presumed they were trained professional troops who'd follow orders, so I worked my way to the tower and laid myself against the north wall by the stairway. I looked for the three warriors on top of the building across the alley. I saw a gun barrel there and started up the stairs.

And received no covering fire to pin down the tower occupants.

I went up four steps before having second thoughts. In my moment of hesitation, a man stepped out on the landing and opened up with a sub machine gun.

I got off four rounds which hit him, pitched him over the railing, and dropped him to the ground.

I discovered something was wrong with my legs. I fell backwards down the stairs and two warriors trampled on me where I lay in the mud.

There was a lot of rifle fire, but I didn't care. Rain fell in my eyes while nauseating waves of pain rippled up from my legs.

There were bright lights in the sky. I'd always wanted to see a flying saucer, and as my lights went out I saw one hovering over me.

"Old comrade, you feel better now?"

I was warm and dry and floating on a cloud in a brightly lighted room. I couldn't feel anything anywhere. Things were dreamlike. "If I'm dead," I muttered, having a hard time getting the words out, "it's better than mud."

A man grinned at me, the ends of his bushy black mustache pointing straight out. It had to be Omer. "Out of the mud, Sandy. You took a seven-point-six in left leg and two in right, above knees, missed bones. Old Pay-pay-shah Sixty good only for shooting flies off the wall."

"Still in Kulala?" I asked thickly.

"*Da*. Bad weather to fight in, but we don't get a choice. Brought a MEST team. They patched you up. Rest easy. We lift at sunrise. I won't fly Dilkons at night in *this* weather except in emergency."

I slipped back in the bliss of nothingness.

Bright sunlight hit my eyes. I heard a turbine whine and felt an aerodyne rocking as it broke ground and stabilized.

"Welcome back." Kivalina had her right arm covered with synflesh. "You should be dead because of what you did."

"Didn't get covering fire. But your armed citizens almost got me first," I told her. "Those idiots shot at everyone."

"I told you they would. They're supposed to make it hazardous for everybody around. We expect they'll shoot a few of our own."

"Lose lots of citizens that way?"

"We've got almost two million in the CitImpy and only nine months to train each of them. We can't expect them to

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be as good as professional warriors. Their duty is to make an invasion very costly."

For both sides, I thought.

There were good medical facilities and people at Vershatets, where I was taken, but I was out the rest of the day. The following day a nurse gave me a glass of sweet glop, and I could walk for a short distance without getting woozy. I wanted Tsaya to fix me, but she was still in L-5. On the third day I discovered an R&R ward outside on the mountain slopes. The doctors were reluctant to let me move there because of "bad weather." On the fourth day I walked out of the mountain to the R&R ward during my required afternoon stroll and refused to go back. They let me stay.

They were right. At 2,400 meters even in the tropics it was cold, but I didn't care. I grew up camping and hiking in mountains.

Omer, Wahak, Kivalina, Defense Commissioner Abiku, and even Rayo Vamori visited me. Vaivan came the day after the ruckus caused by my voluntary relocation from the bowels of the mountain to the outside R&R ward. She was more beautiful than ever, and that made up for not being able to see Tsaya.

"I'm glad you survived," she told me. "When I learned you'd gone to Kulala, I was worried. I had information that something was brewing over there."

"Why didn't you let me know?"

"I didn't see you after you left the C-Cubed meeting, remember?" She sighed heavily and shook her head. "Sandy, that was a risky thing you did. What ever possessed you?"

I thought about that for a moment and finally told her, "Somebody had to do something, Vaivan. And none of the LandImpy warriors was. I know why. Remember my confrontation with Tonol Kokat?"

She nodded.

"Nobody really wanted to fight," I said. "The Commonwealth *code duello* has made you too polite. You act like you'll fight, but you won't."

Vaivan's hand dropped to her iklawa. "Oh, really?"

"Yes, really. And get your hand away from your iklawa," I snapped with irritation. "That motion's almost automatic, but it doesn't make a fighter."

"We'll fight if we're pushed," Vaivan insisted. "We're closer to our savage ancestors than you are."

"Matter of opinion. My forefathers in the last century engaged in sports that killed people while they were playing for fun." I stopped, because my legs hurt in spite of Commonwealth medicine. I calmed down and went on, "Vaivan, I don't doubt you'll fight if attacked. But Commonwealth people aren't used to sticking their necks out as far as they can, then sticking them out a little more."

"What do you mean by that?"

"The French call it *élan*. American military manuals name it 'aggressive motivation.' In the Aerospace Force it was 'letting it all hang out.' Not bravery. Not heroics. Seeing a challenge and taking it . . ."

"The sort of thing you did in Kulala?"

I nodded.

Vaivan sighed. "You're crazy. So's Omer."

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"I know it. What brought him to mind?"

"He stole an aerodyne and flew it to Kulala to get you," she said. "The weather was impossibly dangerous — hundred-kilometer winds through Sayhuto Pass and heavy icing over the Dilkons."

"I owe him one," I muttered, "and we need more like him."

"Why do you say that, Sandy? The impys are well equipped and well trained."

"From what I saw at Kulala, they may not be well led," I said. "Vaivan, I was told to stay put, keep down, play it safe, and not try anything if it's dangerous or impossible. So I pulled an old military leadership trick: I stood up and hollered, 'Follow me!' And they did, because nobody else was leading them."

"Have you mentioned this to Abiku and the indunos?"

"I will."

"Can we do anything about it?"

"No. Takes four to ten years to develop leadership abilities. There's no time left," I said glumly. "We're about to be tested."

"For what? We've withstood the test of fifty years . . ."

"During which all you did was keep your klutzy kalakak neighbors out of your back yard. That wasn't done well at Kulala, although we muddled through to victory anyway. Shouldn't have happened in the first place."

"What went wrong?"

"The indunos are enamored of their own staff studies. They may be competent, but they're complacent."

"That's hard to believe. There's nothing wrong with our system."

"We're going to find out how good it *really* is by going up against others."

"We'll win."

"Saying it doesn't make it so."

"You told me not to underestimate the enemy," Vaivan said. "Sandy, I'm telling you not to underestimate your colleagues and friends. The years since the Founders' War may have taught us to control our violent tendencies, but it's a pretty thin shell."

"I hope so."

"Plans will be changed, Sandy," Vaivan went on. "You're keeping our thinking from becoming inbred, something far more dangerous than getting physically soft or letting defenses grow lax. You're staying here to keep on doing . . ."

"Vaivan, I've got to get back to L-5!" I objected. "We've got to head off a modern version of Space War One. There's a ten-gigawatt powersat idle at one-zero-five East Longitude. We've got to support Rutledge and his RIO teams. They may need our muscle because they're unarmed."

"I don't believe you've got a case there, Sandy," she told me. "The major action is going to be here on the ground, and your job will be helping Abiku fight off our nasty neighbors."

If I stayed in Vershatets, it would be a major change of plan. The worst military mistake any general can make is to change his carefully made plans before the battle instead of letting the action take shape before moving opportunistically. A good general, which automatically means a winning general, knows when to throw out the prearranged plan and go with the flow.

Maybe Vaivan knew something I

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didn't, but I doubted it. Regardless of what her spies said, my military background told me there was no way any of our neighbors could handle the professional impys, to say nothing of the CitImpy. And I couldn't see the Tripartite becoming involved in a long and drawn-out war to break up the Commonwealth. Military action would have to come from another source. There had to be something we hadn't considered, but I didn't know what it was.

I had time to think about it. I began to feel better as my body recovered from the shock of wounds and blood loss.

Although Vaivan's regular visits fed my libido, I also looked forward to seeing Omer, who came daily bringing both the flowers of Tartar tradition and a half-liter of either vodka or *supaku*.

We swapped stories about the Good Times we'd had in our respective former services. Aerospace jocks are the same everywhere, letting it all hang out as far as possible in the hottest machines available, then sticking it out a little more just to tell the world to go to hell because they're the best. It's still called "hangar flying." Omer and I flew a lot of hangars.

I tried to follow what was going on in the world through the telenews nets and got different slants, depending on whether I watched the internatnet or the Commonwealth net. But Omer always brought me the piece of hot skinny that filled in the whole picture.

I may not have the full story of what happened and why, but I understand why Duc Francois de la Rouchefoucauld said, "History never embraces more than a small part of reality." The history books *do* lie!

Kivalina and I had been caught in a guerrilla operation at Kulala. A Kalihol group wearing CitImpy brassards took over the Kulala Despatch, killing the ComTrans people. Then they permitted their compatriots, also marked as CitImpy, to take the food train up Sayhuto Pass instead of continuing northbound to its scheduled Ilkan destination.

They wouldn't have gotten caught if the signals man at Sayhuto Pass hadn't noticed Singh's report of crossing the food train. Sayhuto Pass was the changeover point between the Oidak and Kulala divisions and normally got signals from both. Oidak Despatch had given Singh a green board out of Sayhuto Pass because they knew of no train coming up the west side of the Pass. And Kulala Despatch hadn't told Sayhuto Pass of a southbound special. So the Sayhuto Pass signals man called Kulala for confirmation of the unscheduled train and couldn't get an answer. He called Oidak Despatch and reported it. They in turn told Vershatets, where Pahtu ordered her garrison in Kulala to investigate.

Meanwhile, the Kalihol crew deliberately derailed the train in a tunnel on the west side of Sayhuto Pass, effectively blocking the line, after which they disappeared into the hills.

That's the way we pieced it together.

Omer added, "When we found out in Vershatets, they pushed panic buttons. They wouldn't let me fly. Bad weather, they said. But *Frontovaia Aviatsiya* flies in worse. I stole an aerodyne from Vicrik AirImpy Base."

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"Risky, Russkie." I was the only one he allowed to use that nickname.

Omer shrugged and grinned. "It was not difficult. Compared to the *Frontovaia Aviatsiya*, AirImpy security is nothing."

The world press thought it despicable that the profit-mad Commonwealth, "already suffering hunger and privation from the trade embargo, would seize a train carrying food to the starving natives of the Ilkan Empire." The Kulala Incident also caused the Emir of Kalihol to send a warning note to Commonwealth President Conobabi Nogal. The Emperor of Ilkan puffed himself up on telenews, medals glittering, and demanded the release of the train and its contents within twenty-four hours.

ComTrans CEO Kohato Tatri himself was on the scene with the crews, trying to get the Sayhuto Pass line open again. There was no way ComTrans could return the train immediately. President Nogal said as much in a telenews statement that wasn't seen outside the Commonwealth. His offer to permit both Kalihol and Ilkan observers on the scene was ignored.

ComTrans met the ultimatum by cutting the derailed Rhodes Railway Diesels off the front end of the train, coupling ComTrans units from Kulala on its rear end, backing it down to Kulala, and hauling it north to the Ilkan border. Since Ilkans didn't know how to operate ComTrans' advanced technology coal-burning units and wouldn't permit ComTrans crews to take the train into the Ilkan Empire, the train sat at the border for two days. ComTrans ran ice from Kulala to keep the reefers cool, but almost half the food aboard either spoiled or was stolen by Ilkan looters. The spoilage and theft were blamed on the Commonwealth by telenews, but not one word of ComTrans's gut-busting effort to keep the reefers iced was mentioned.

I'd been in sick bay for about ten days and was getting restless when Omer burst into my room shortly after breakfast. He had a hard copy in his hand.

"Sort of early, isn't it, Russkie?" I asked.

"Not early. Almost too late. Look!" He thrust the hard copy in front of me.

120450> MESSAGE 12037> VERSHATETS DEFENSE HEADQUARTERS SIGNALS FROM TOPAWA SIGNALS> KALIHOL RADIO REPORTS COMMONWEALTH LANDIMPY ATTACKING RHODES RAILWAY KHIBYA STATION JUST INSIDE KALIHOL BORDER> MESSAGE 12037> 0318Z> END>

120450> 0320Z> MESSAGE 120311> KULALA SIGNALS FROM VDH SIGNALS> REPORT STATUS OF GARRISON AND CITIMPY> CONFIRM NO CROSSING OF KALIHOL BORDER TO KHIBYA> CODE NEGO> MESSAGE 120311> 0321Z> END>

120450> 0330Z> MESSAGE 120312> VDH SIGNALS FROM KULALA SIGNALS> CONFIRMING GARRISON IN CASERN> CITIMPY ON STAND DOWN IN HOMES> CONFIRM CONFIRM NO NO CROSSING REPEAT CONFIRM NO CROSSING OF KALIHOL BORDER TO KHIBYA BY ANY LANDIMPY> CODE TRANCILETO> MESSAGE 120312> 0331Z> END>

120450> 0345Z> MESSAGE 120313> VDH SIGNALS TO ALL SIGNALS> RED ALERT> RED ALERT> RED ALERT> THIS IS NO DRILL> STAND BY FOR ORDERS> CODE PASKO> MESSAGE 120313> 0346Z> END>

"Where'd this come from?"

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"Vaivan's teleprinter. What you think?"

"Terrorists," I replied. My hands were shaking slightly as they held the hard copy. "Ilkans in LandImpy uniforms paddled across Lake Nyira and hit the Khibya station."

"*Da!* Khibya is another Gleiwitz." He was referring to the German radio station attacked by Germans in Polish uniforms the night before Poland was invaded in 1939.

I'd suspected something like this was going to happen. The Khibya attack was a propaganda ploy. The one it was patterned after hadn't worked, but that didn't stop them. "We're about to be blamed for starting a war with our neighbors because we got caught stealing a food train . . . which nobody knows we don't need because everyone else around us is starving. We're embargoed, so we're supposedly starving, too."

"Sandy, it is time to act. We have our job to do."

"Vaivan thinks I can do a better job telling the indunos how to fight here.'

"Your job is not here."

"I know, but I may not be allowed to leave."

Omer grinned broadly again. "I get out of Soviet Union. I show you how to get out of Commonwealth!"

I still had three holes in my legs, but I could walk. Once in space I wouldn't need my legs anyway. And I knew a beautiful doctor in L-5 I wanted to see in the worst way, because I had to tell her something I'd neglected to mention before.

And I was worried about those ten billion watts from powersat One-Zero-Five-East.

"Got a spare pair of pants with you?"

He had a SpacImpy flight suit in a package under his arm.

We walked out of the R&R center acting like we'd just visited a friend. Omer had "borrowed" a landcar somewhere. I let him drive . . . and was sorry. "I cannot steal another aerodyne. They know me at the AirImpy base. But I have Landlimo aerodyne borrowed from Vamori-Free. I almost did not get here, so we may have to bootleg back because there is a big political fight between business and military because of Red Alert."

"I'll bet Abiku was pressured into drastic measures by the impy indunos."

"*Da.* Captain Kevin Graham says they are arguing about it right now. Abiku wants to suspend all non-military transport operations."

"Abiku can't stop the system with a snap of his fingers! It has too much inertia!"

Omer nodded. I just hung on. "Graham is fighting for freedom to move. It will make some delay for Abiku. We will use it. Politics are bad. I do not like politics. I am a warrior and I go where I must to do my job." He grinned. "But not as *Frontovaia Aviatsiya* or *Kosmonautika* or AirImpy or SpacImpy now. As Landlimo pilot. It makes difference. Hah!"

"Uh, Omer, this is too fast for this road!" I complained.

"This is good road! You must see roads around Magnitogorsk or Chimkent. Very bad."

I was in the hands of the Mad Russian Space Jockey, and there was nothing I

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could do. Omer was letting it hang out. He brought the car to a halt on the edge of a mountain meadow. A Mikasa Facel aerodyne was parked there.

My legs hurt as I got out, but I'd rather fly than let Omer do it. "Russkie, you know the country. I'll drive."

"You know how to drive a Mikasa Facel?"

"I owned one once. Just right for this." A Mikasa Facel had won the Madras-Colombo Classic two years in a row.

I scanned the sky before stepping in. There were scattered clouds about 1,000 meters above us. "We'll go visual in spite of the weather," I decided. "We'll have no hassle with traffic control and it'll save us trouble if Abiku tries to shut down everything." I strapped into the familiar seat, punched the start code — Commonwealth Founding Day—and felt the old surge of excitement as the big turbines spooled up. The Mikasa had gobs of Coanda-lift surface and big turbines to blow them.

Omer set the nav station identifiers into the computer. "Course does not contain rocks if you do not descend below two-six-zero-zero meters to DEK nav station. Bust clouds. *Prodolzhai!*"

The flight was not for the faint-hearted. I used tacair procedures without the benefit of tacair equipment. There were times when I bent rules and entered clouds. I was worried that the clouds might contain rocks because I'd always been taught they did. Omer assured me they didn't. He was right.

We monitored comm but heard nothing except routine traffic. We kept a silent radar profile, not using forward scan or radar altimeter, only the required radar transponder with a visual flight code. I wanted to look like Bill Flannelmouth The Travelling Salesman starting to make his rounds for the day.

Once we'd cleared the rocks and crags of Vicrik and Dekhar Gorge, the weather broke into high thin clouds with visibility reduced only by haze. I flew not more than a hundred meters above the savannah and the spring crop of hypergrains. There are detectors that can spot a target on the deck, but I was counting on the traffic overhead to mask us.

"What happens at Vamori-Free?" I asked, as we sped eastward.

"I'm scheduled to lift the *Tomahok* to L-5 at noon local time," Omer said. "You'll be aboard."

"Who does the manifest say I'm supposed to be?"

"Co-pilot will oversleep. You will be assigned instead. Is all arranged."

"By twelve-hundred hours, they'll be looking for me, Omer."

"You want to put on my mustache maybe? Sandy, I have many friends at Vamori-Free. And people there do not like the idea of stopping freedom of space. The League of Free Traders has members other than space pilots."

"Landlimo people?"

"*Da!* What does company name mean? Frontier is free and must stay free! What else we fight for?" The Mad Russian Space Jockey checked the nav computer. "In two minutes, bounce to a thousand meters and get approach clearance to Area Seven-seven."

The launch area was identical to Area Seven-three, but there was something different about the *Toreva*-Class packet on the catapult. I mentioned it to Omer

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as we parked the aerodyne and sauntered across the pad as couth as any pair of space jocks.

"Has been refitted with 'tracking enhancement' equipment. It is actually partial hell beam hardening," Omer said quietly.

"Who instigated that?"

"Ali."

Maybe all Commonwealth people weren't such polite non-fighters after all.

But when we got in the flight deck of the *Tomahok*, Omer told me, "Sandy, take the left seat. Fly it. I run nav and countermeasures. Is touchy out there now. Engagement zones are expanded. United States, Europa, Bahia, all announce new requirements five days ago."

"Sounds like transition-to-war conditions."

"Maybe. Commonwealth ships have had problems. Somebody soon maybe make a 'mistake' with a Commonwealth ship," Omer said. "Or we get clearance that takes us into engagement zone. So I got from Kevin Graham new data showing positions of all orbiting objects and load into computer. I will make sure clearance and trajectory do not lead us into danger."

Twenty minutes before noon clearance came over the up-link. Omer checked it and gave a thumbs-up. We made a straightforward departure with the catapult slinging the *Tomahok* into the air at a one-gee goose.

The *Tomahok* was handed-off from Madras Center to LEO Orient Center as we passed through a hundred kilometers. I expected something to happen then. It did. "*Tomahok*, this is LEO Orient Center. Amended clearance." It came on the up-link.

Omer shook his head. "*Bojemoi!*" he exploded. "Reject it!"

"LEO Orient Center, this is *Tomahok*. Negative the amended clearance, sir."

"*Tomahok*, what's your reason for refusal?"

"What's your reason for issuing this amended clearance, sir?"

"AmSpace Command request through LEO Canambah Center."

"The amended clearance takes us into the engagement zone of Gran Bahia *estação baixa doze*."

"*Tomahok*, stand by . . . *Tomahok*, amended clearance: De-orbit for Woomera landing. We can't get you through."

I knew what to do, and I let it all hang out. "LEO Orient Center, *Tomahok*. Negative the amended clearance. We are initiating no-clearance flight under I-A-R regulation ninety-one-point-eight. We'll go to L-5 as filed under our responsibility to detect and avoid."

There must have been consternation in LEO Orient Center. It took several seconds for the traffic coordinator to acknowledge, "Uh, *Tomahok*, Center, service is terminated. Proceed on your own responsibility. Retain your current beacon code."

I acknowledged and told Omer, "Get ready to thread the needle, Russkie! Let's see if we're good enough to make L-5 before somebody burns us with a hell beamer!"

CONCLUDED IN NEXT ISSUE

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brass tacks

Dear Mr. Schmidt:

I watched the Moral(?) Majority(?) editorial (January 1982) and the responding letters with interest. I was surprised to see that no one followed the line of reasoning that says that redneck fanatics like Jerry Falwell, et al, are necessary to the survival of our society.

Perry Oliver started down the center of that road when he said that "Morality in general is rules for survival." But he did not follow through either on definitions or the complete chain of logic.

"Morals," "ethics," "law," "rules," "custom," are all part of Mr. Oliver's "rules for survival." But neither he nor anybody else stated the obvious: *Rules for survival evolve* in Darwinian fashion, governed by the same rule of "survival of the fittest."

Environmental conditions, natural and man-made alike, change constantly. Because of this, a rule for survival that is beneficial today may become harmful tomorrow. This forces all high-survival species—with Man at the top of the list—to allow small groups to experiment with new lifestyles. Undisturbed, the experiment will either die out if it proves harmful or gain adherents and eventually become predominant if it proves beneficial. But it will take generations, causing many deaths along the way, if it proves harmful. In a critical competitive situation, the process could well cause the death of a society if the experiment proves harmful.

The testing process can be greatly accelerated by subjecting it to the opposition of the redneck fanatic who opposes all change—the Jerry Falwells and their cohorts. Societies who set up the proper balance between the "New Moralities" and the Jerry Falwells greatly enhance their survivability by speeding up their response to environmental change—from several generations to a

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few years in this day and age of world-wide instant communications. I can think of two good examples.

Prior to ARAMCO, the Saudi Arabian Wahabi tribesman had only a few goatskins of water between him and death on his weeks-long trek from oasis to oasis. Under those circumstances, it was a "sin" to take a bath—a "sin" which carried its own penalty. Comes ARAMCO with their wells and Mercedes trucks, and two men can drive a truck from oasis to oasis in half a day. If they break down and lack parts to get going again, another truck will be along soon. Now the diseases and parasites become the predominant influence. Today it is a "sin" not to take a bath in Saudi Arabia.

The change took place in a controversy worse than Jerry the Falwell and his opponents. Arabia's fanatics shoot people for bathing on rare occasions yet today! But more bathers survived in better health, so their "moral" became predominant.

In the United States, the "hippie" counter-culture challenged everything in sight during the sixties, including drugs, sanitation, booze, and productive work. That part of the counter-culture cut into their survival rate so badly that it went down in chaos. But one idea remains, under test right now by Jerry the Fallen and his Moral Morons. Sexual freedom. Abortion. Divorce. Marriage. Children. Adultery. Incest. The whole gamut of sex and sex-related "morals."

For eons the Christian restriction of sex-in-marriage-only withstood attacks, violation providing its own penalty in the form of death by agonizing disease, deformed children, etc., all caused by venereal disease spread by promiscuous sex.

Today, medicine is on the ragged edge of controlling venereal disease, both through treatment and inoculation. Once past that, the adverse effects of driving young people into ill-advised marriages, with the child abuse, divorce, domestic violence, lowered economic productivity, etc., will become the predominant influence.

This does not mean I expect to see 'em shoved willy-nilly into on-the-job sex classes in kindergarten. But I do expect to see sexual freedom among the unmarried, within the limits of disease and pregnancy control, within my lifetime—and I am sixty!

Medicine will also change other facets of sex, marriage, and child-rearing. Birth control will lessen—but not eliminate—the sanctions against incest. Adultery will probably be encouraged as a means of relieving sexual pressure on wives during late pregnancy, just after childbirth, during illnesses, and probably as a means of relieving sexual pressures when one spouse has a lower sex drive than the other. I expect to see sanctions against divorce when there are dependent children in the home that make the Middle Ages look tame, but I expect divorce to be permissible within the limits of control of economic parasitism once the youngest child leaves home. I expect to see birth control almost mandatory among the unmarried, abortion discouraged among the married, possibly prohibited if the fetus is healthy.

I guess you could summarize it as "Sex for fun, marriage for kids."

Jerry the Fallen has already done this society a great service by directing public attention to these issues. I expect him to win a few battles, but overall to go down to defeat when medical science actually gets control of the two dozen or more kinds of VD. When that time

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comes, he will cut many years off our adaptation time.

I despise the ground Jerry Falwell walks on, but I am forced to admit that he serves a useful function in our society, if not for Homus the Sap himself.

Dammit! There *MUST* be a better way! I hope somebody finds it!

EUGENE AUSTIN

4623 E. Washington, Apt. 20
Orange, CA 92669

Dear Mr. Schmidt:

Sam Nicholson's "He Who Fights and Runs Away" (Mid-September 1982) is, if one accepts his premise, the very first convincing argument *against* space colonization that I've run across.

Nicholson's space colony is run by the Moral Majority; it is a joyless landscape of endless toil. It would be more fun to live in Albania!

Fortunately, the premise is faulty; the Moral Majority types are as hostile to science as they are to "vice." We sinners, on the other hand, are always looking for fresh horizons. I don't think there's much doubt who will go to space and who will stay home.

ED CLARK

San Francisco, CA

Dear Mr. Schmidt:

Though there are countless stories concerning the piloting of spacecraft, the in-flight repair of spacecraft, and the remarkable principles upon which spacecraft might conceivably operate, I cannot recall any stories about the manufacture of spacecraft. Every heroic tale of adventures on and between distant planets implies, somewhere, at least one spaceship factory.

Some of these establishments are obviously enormous. One wonders whether they are owned privately or publicly, whether any degree of industrial democracy is practiced in them, whether they are ever afflicted by strikes. The people we read about in space fiction never seem to concern themselves with such matters. They take the manufacturing sector for granted. *What*, in short, *about the workers?*

EDWARD WHEELER

Newtown, NSW, Australia

Good question. Do some writers out there have good answers?

Dear Betsy and Stan,

We thought you'd be interested in the enclosed photo. As you can see, Corwin is developing a real taste for science fiction (" . . . and three out of four babies surveyed prefer *Analog* to any other SF magazine . . ").

TIMOTHY ZAHN

Urbana, IL

Corwin Zahn, 9 ½ months

Dear Mr. Schmidt,

This letter is in response to C.M. Fitchett's plea published in "Brass Tacks" in the May 1982 issue of *Analog* and an introduction to Real World Ltd., a scientific consultancy incorporated in the state of California. A major activity of our consultancy is to provide accurate

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Dear Dr. Schmidt:

While I very much enjoyed Jerry Pournelle's article on economics in the Mid-September issue, I was wondering if he had ever heard engineers testify in court as expert witnesses? At the recent congress of the American Society for Quality Control there was a re-enactment of a liability trial, with the original judge, attorneys, and engineer-witnesses participating. The suit involved a small manufacturer of electronic equipment and a large marketing and distributing company. The contract called out a reliability requirement of so many hours Mean Time To Failure (MTTF).

Plaintiff contended that the product failed to have the stated MTTF; defendant held otherwise. Each produced an expert engineer witness who duly testified as required.

Using the same data set.

What was the problem? Each engineer, at his employer's bidding, had used a different definition of "Failure." The plaintiff used a definition that was clearly intended to exaggerate the failure rate. Defendent used one that just as clearly underplayed it.

So I cannot fault psychiatrists for testifying on both sides of a sanity hearing. They are no worse prostitutes than their engineering counterparts.

The fundamental problem in the soft sciences is the lack of operational definitions. Suppose an economist *does* predict a depression (about as likely as an engineer proclaiming his product's inadequacy). When it does happen, the other "school" denies it, saying it is not a depression, only a "rolling readjustment." (Anybody remember when depressions were called Panics?)

If engineers have a hard time defining terms (What do you mean, "round" or "red"?), how much more so the social scientists who deal with subjects far more emotionally loaded?

MICHAEL F. FLYNN
Certified Quality Engineer
Golden, CO

The author replies:

I never said the job was easy; I just grow weary of it being done without serious tools.

Dear Stan:

"To the Stars!" in this issue is a nice article, but as a staunch Englishman I was saddened to see that unfortunate "quote" of Richard Woolley's perpetuated! May I set the story straight?

Dr. Woolley had just arrived in Britain to take up his post as new Astronomer Royal, after a tiring flight from Australia. Surrounded and jostled by pressmen asking his views on absolutely everything, he was reduced to snap answers like "Bilge!" to a good many questions. One of them happened to be: "What do you think of space travel?"

Hope you like the cover design, anyway.

DAVID HARDY
Birmingham, England

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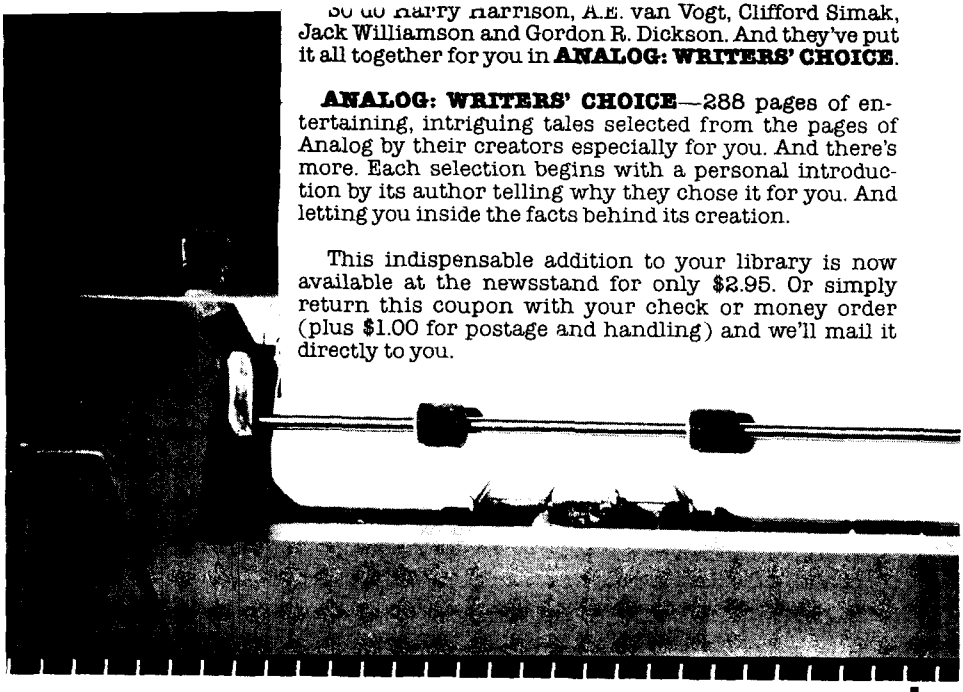

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27-30 May
THE SOL III CONVENTION (UK Star Trek convention) at the Grand Hotel, Birmingham, England. Guests—James Doohan, Walter Koenig, Anne McCaffrey, Bob Shaw. Speakers, films, videos, fancy dress & drama comps, dealers, art, etc. Info: SOL III Committee, 39 Dersingham Avenue, Manor Park, London E12, England. (Use airmail.)

27-30 May
SWAMPCON-4 (New Orleans relaxacon) at the Sheraton Hotel, Baton Rouge, La. Guests of Honor—Jo Clayton and George Alec Effinger; Fan Guest of Honor—John Newman. Films, art. Registration—$10 until 1 May, $12 thereafter; plus banquet $17 until 1 May, $20 thereafter. Daily rate—$6 at door. Info: BRSFL—Swampcon, Box 14238, Baton Rouge LA 70898 (include S.A.S.E.).

28-29 May
QUESTICON 3 at the Travelodge Central, El Paso, Texas. Guest of Honor: Andrew J. Offutt. Thieves' World format. Registration: $10 in advance, $12 at the door. Info: Carol Smith, 903 Bellas Artes, El Paso TX 79912.

3-5 June
SATYRICON II (21st Deep South SF conference) at Hyatt Regency, Knoxville, Tenn. Guest of Honor—Stephen King; Fan Guest of Honor—Guy H. Lillian III; Artist Guest of Honor—Doug Chaffee; TM—Barb Wagner; Surprise(d) Guest—Karl Edward Wagner; Special Guest—Chelsea Quinn Yarbro. Films, art show, auction, hucksters, video programming. Registration—$15 until 1 May, $18 thereafter and at the door. Info: Satyricon II, Box 16140, U.T. Station, Knoxville TN 37996.

6-8 June
National Educational Computer Conference (IEEE) at Baltimore, Md. Info: NECC, Box 639, Silver Spring MD 20901. 301-589-3386.

9-12 June
13th Annual Conference of the Science Fiction Research Association (academic SF conference) at Midland, Mich. Theme—Science Fiction: Arts and Sciences. Special program on Soviet SF. Info: Joseph W. De Bolt, Depart of Sociology, Anthropology & Social Work, Central Michigan University, Mt. Pleasant MI 48859.

1-5 September
CONSTELLATION (41st World Science Fiction Convention) at Baltimore Convention Center, Baltimore Md. Guest of Honor—John Brunner; Fan Guest of Honor—Dave Kyle; TM—Jack Chalker. Registration—$15 supporting at all times. Attending—$40 until 1 July, more at the door. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: ConStellation, 41st World Science Fiction Convention, Box 1046, Baltimore MD 21203.

—Anthony Lewis

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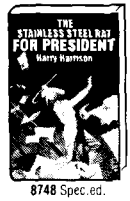

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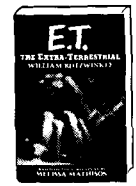

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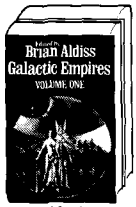

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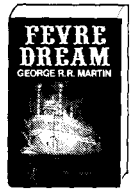

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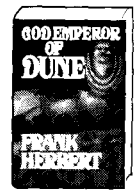

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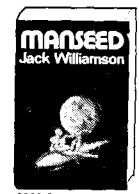

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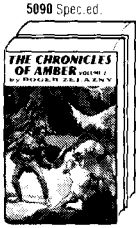

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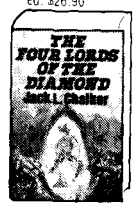

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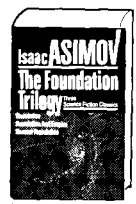

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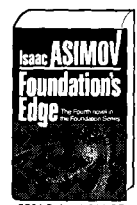

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